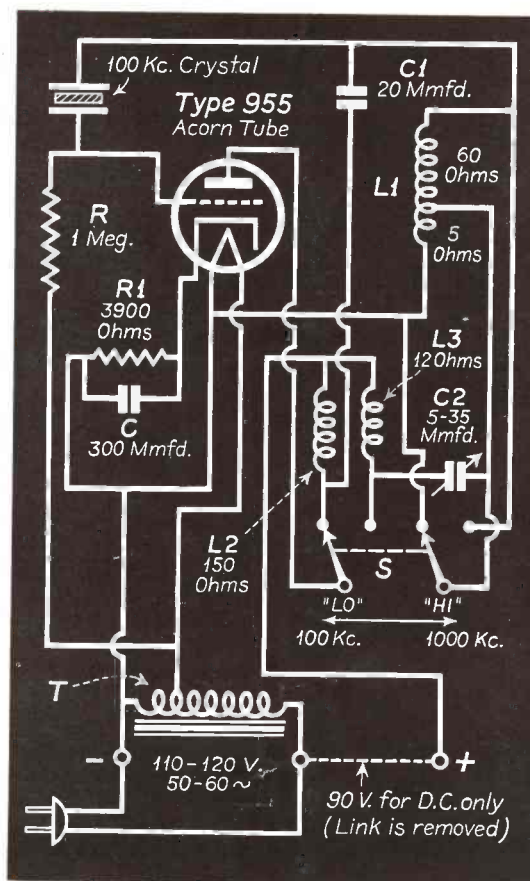


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SERVICE

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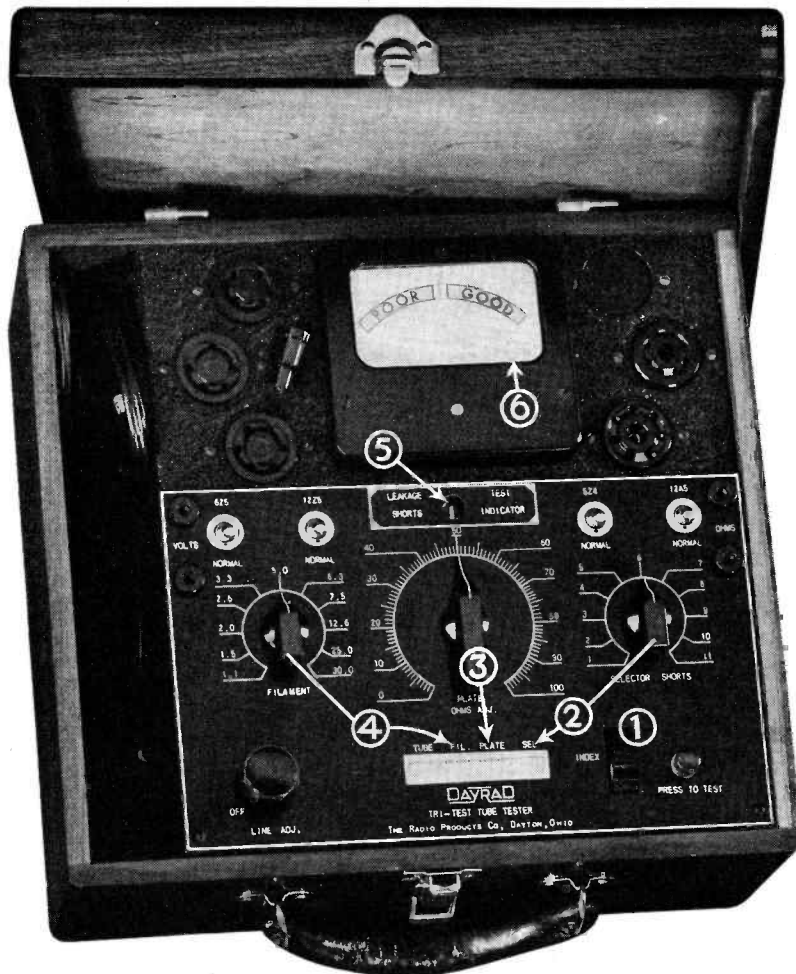
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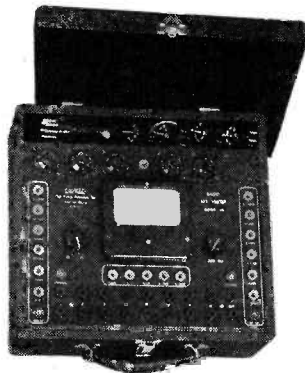
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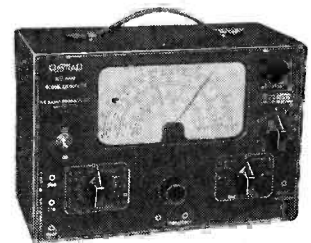
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THE ANTENNA . . .

WATCH YOUR DRIFT

NO AUTOMOTIVE ENGINEER would ever think of adjusting intake and exhaust valves with the motor cold. No Service Man with his wits about him will align a cold radio receiver.

A receiver should be given time to warm up before any inductive or capacitive adjustments are made. Inductance and capacity values alter with temperature, and the *correct* values for any adjustments are those obtained with the receiver at a temperature equal to that reached and maintained under sustained operating conditions. It takes from ten to fifteen minutes at the least to reach this temperature. Consequently, a receiver should be given about a quarter hour to warm up completely before a trimmer is touched.

This precaution is absolutely essential when aligning an all-wave or high-fidelity receiver of modern design. Frequency drift cannot be tolerated in either type of set; neither can misalignment.

• • •

OUT OF THE DOLDRUMS

RCA HAS BROUGHT OUT an important point in recent advertisements—a point no Service Man can safely ignore. And the point is, that the set owner, like the fellow who has halitosis, is very seldom aware of the presence of a distressing condition. And, the fellow with an evil-sounding radio is in about the same position as the fellow with halitosis—even his best friends won't tell him that there is something rotten in Denmark.

The rub is that a radio set goes sour so gradually that the difference is not noted until things get so bad that even the dog yowls when the receiver is turned on. All because the human ear has the obnoxious habit of not only getting used to distorted sound, but almost getting to like it . . . until it is given the opportunity of a direct comparison of good and bad reproduction from the same set.

From the same set, mind you—and there enters the second rub; for it is an actual fact that a man may listen to a real fine receiver in his neighbor's home and still fail to realize that his own set sounds like the music on a Chinese phonograph record.

And right there, of course, is where *you* fit in. If you can convince the set owner that his receiver is far from being the musical instrument it was when he first purchased it, and on the face of this obtain a reconditioning job, he will end up by agreeing with you. And, you have a good talking point, too . . . *your ears* are not acclimated to a single radio, and in consequence are conscious of differences in the quality of reproduction. Because of this fact, your ears are *trained* whereas the ears of the listener are not: *You* know when a set is sour—the set owner doesn't.

Don't wait for these jobs to come to you—go and get 'em. It's good, clean business and consequently should be highly desirable.

• • •

APARTMENT-HOUSE AERIALS

THERE IS NOTHING so discouraging to look at as the roof of an apartment house criss-crossed with aerial

wires. It is surprising for one thing that landlords will stand for these blots on the landscape, and surprising for another thing that the wires serve any purpose at all.

The truth of the matter is that landlords never would have permitted tenants to string wires on the roofs had they known of some suitable system to take the place of antennas. Multiple antenna systems weren't available when broadcasting first started, and now that tenants and landlords alike have become innured to the maze of wires on rooftops, there seems little that can be done about it.

Certainly, you can't tell a set owner that his aerial is about as inefficient as a clothesline, for he'll tell you that he gets the stations all right, and would you mind going to hell. But a landlord, who is interested in keeping up the appearance of his building and seeing to it that the best type of service is given his tenants, might listen to reason.

Many new apartment buildings in large cities are equipped with multiple antenna systems and individual "radio outlets" in each apartment. Tenants are not permitted to string wires on the roofs of these buildings; they must use the radio outlets. The result is that tenants are able to tie in on an efficient antenna system and in the long run get much better results from their receivers. And the buildings don't look like experimental hook-ups.

Why not contact landlords with a view to installing real multiple antenna systems? The cost to a landlord could be offset by charging each tenant who wished to use the system a flat sum, or small rental which, in either case would be less than they would normally pay for an individual aerial installation. If the charge included guaranteed antenna service, the tenant would probably be willing to meet the expense without complaint.

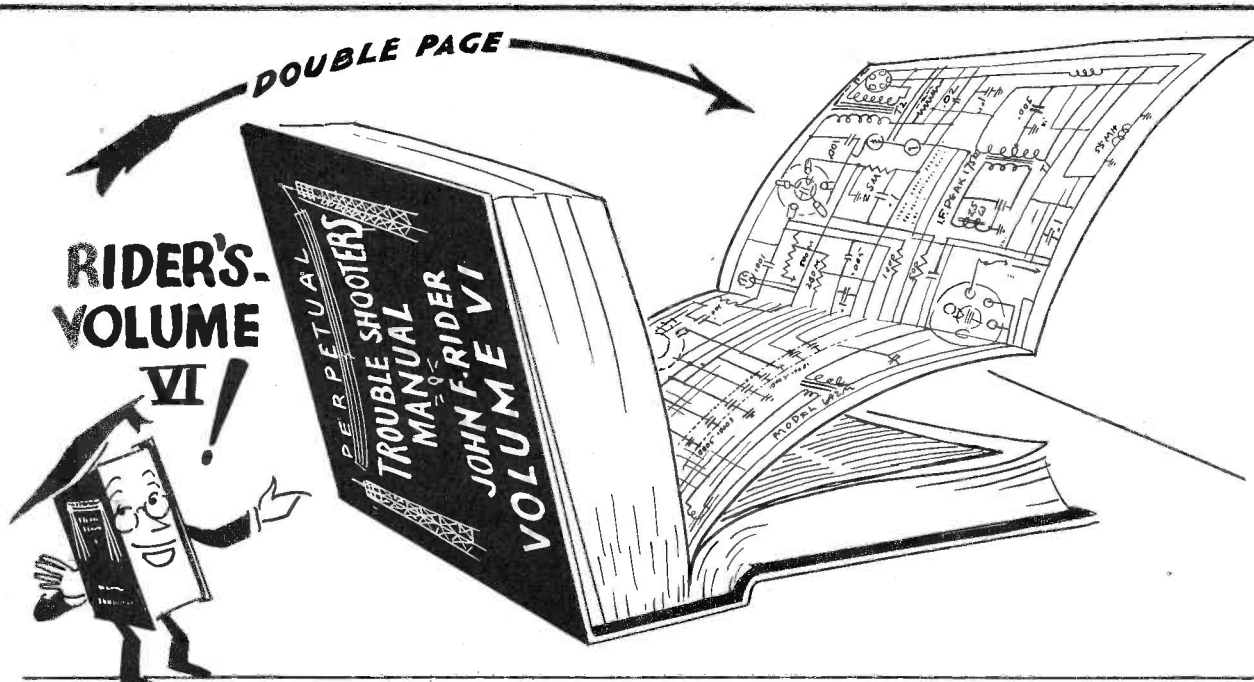
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AMATEUR INTERFERENCE

IT HAS BEEN BROUGHT to our attention that numerous Service Men who, upon receiving a complaint from a set owner that a local amateur phone transmitter is interfering with program reception, immediately offer the suggestion that the set owner report the offender to the Federal Communications Commission. This is short-sighted.

In the first place, the Federal Communications Commission has plenty to do without being bothered by such complaints. In the second place, there is no reason why the Service Man shouldn't first check up with the amateur to determine what should be done. Thirdly, we see no reason why the Service Man shouldn't take advantage of the profits to be made from the sale of wave-traps to eliminate the interference. And, lastly, since a Service Man is supposed to provide service to his client, why should he pass the buck on to the F.C.C.? It would be simpler for everyone concerned if the Service Man would take care of such situations as they arise.

When an amateur ignores a complaint is time enough to have the matter reported to the F.C.C.—not before.



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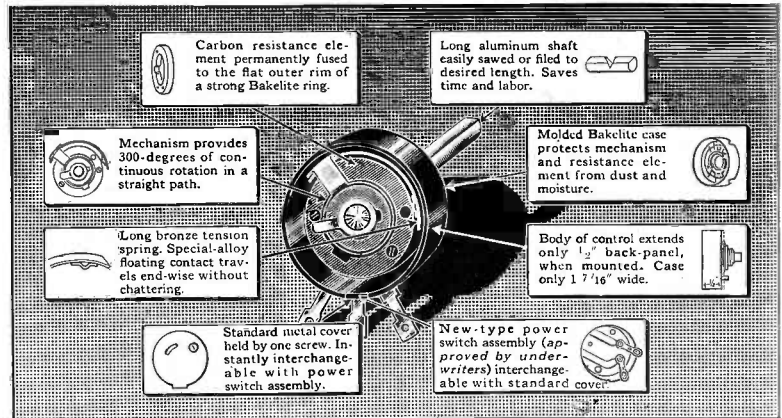
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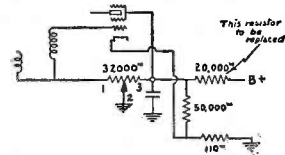
STUDY the illustrations and you will appreciate the engineering refinements which make this the outstanding volume control available for replacement purposes.

In addition to all standard volume controls, Electrad manufactures a complete line of special replacement controls—exact duplicates, mechanically and electrically, of controls used originally in certain specific receivers. These and all standard controls are listed in the Electrad Volume Control Guide, together with other valuable service data.

See free Volume Control Guide offer below.

Special Application of Electrad Control No. 298 to Stewart-Warner Receiver 950 A.C.

STEWART WARNER 950 A.C.
ELECTRAD SPEC 298



The diagram shows one of the many special applications of Electrad Controls fully described in the Electrad Volume Control Guide. (See free offer on this page.)

When replacing the volume control in the Stewart-Warner Receiver 950 A.C., it is important that the 20,000 ohm resistor, indicated by arrow, be replaced by an Electrad wire-wound vitreous resistor of 10-watt rating. The carbon resistor used in this position causes faulty volume control operation due to change in value.

Use Volume Control No. 298.

Use Vitreous Resistor, 10-watts, 20,000 ohms.

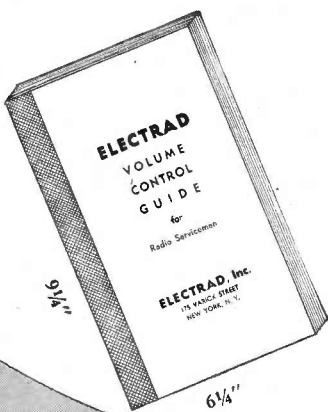
This control has been redesigned to provide an internal connection between terminals 1 and 2 and a properly tapered rheostat between terminals 2 and 3. This improvement greatly reduces the possibility of noise and increases the current carrying capacity of the control, insuring far more satisfactory operation.

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR NOVEMBER, 1935

PROFITS IN OLD SET CONVERSION WITH MODERN METHODS

By Tobe Deutschmann*

This is the second in the series of Mr. Deutschmann's practical articles for the radio Service Man. Modernization jobs of this nature were on exhibit during the recent convention of the I. R. S. M. in New York City, where the opinion was generally shared that real money-making possibilities exist in this idea of bringing old receivers up-to-date, with all-wave, avc features.

ASIDE from the considerations of reasonable cost and excellent performance, the electrical and mechanical adaptability of the Browning-35 suggest its use in receiver modernization. It is, as most readers are aware, a seven-tube superheterodyne (eight tubes in the metal tube model), employing a pentode output tube resistance-coupled to the diode detector-amplifier. This arrangement results in considerable electrical flexibility. In cases where the audio amplifier of the original receiver is satisfactory, the power stage in the Browning may be dispensed with, and the output of the second detector resistance-coupled to the original system. In some instances, it may be desirable to retain only the power stage of the old receiver—push-pull 45s for example. The output of the diode detector-amplifier will not be sufficient to swing these grids, so the pentode is retained, but operated as a Class A driver. The screen grid is connected to the plate and the 400-ohm bias resistor is replaced with 640 ohms. The output impedance of this arrangement approximates that of a 27; thus the input transformer is readily available.

TWO- OR SIX-VOLT

As this chassis can be obtained in either 2- or 6-volt models, it will often be possible to eliminate the power transformer and operate the receiver entirely

from the original power pack. (It is, however, not desirable to reverse this process and take care of an external amplifier from the Browning power supply. While designed and constructed with a considerable margin of safety, it would probably be overloaded in many such cases.) Where a reasonably good dynamic speaker is incorporated in the original set, it is almost invariably possible to retain this in the conversion, sometimes even without substitution of a different output transformer.

CUSTOMER PSYCHOLOGY

Obviously, the more parts that can be salvaged from the old receiver, the lower will be the cost to your customer without in any way curtailing your profits. The psychological element should also be considered. The more

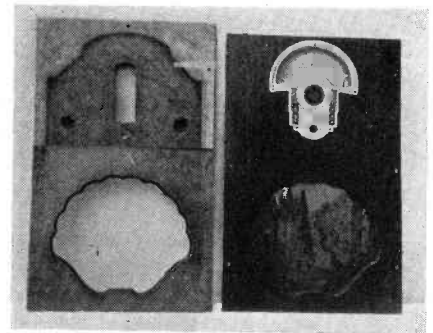


Fig. 2. The old and new Philco panels—the former having been used as a template.

that is retained from the original receiver, the more the owner will feel that it is his old set brought up-to-date.

As we have mentioned before, the chassis under consideration is available either for glass or metal tubes, and advantage may be taken of the psychological preference of your client in this respect. If a metal-tube receiver is installed, the Service Man should satisfy himself that he is supplying tubes that will stand up. There is no difference in performance between the glass and metal tube models.

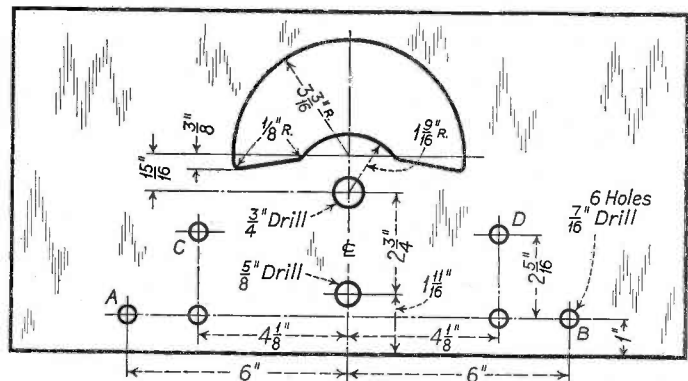


Fig. 1. The general panel layout for modernizations, with dimensions referred to the chassis base and center line.

*President, Tobe Deutschmann Corp.



Fig. 3. Behind the scenes with the converted Philco 65. This is one of the simplest receivers to modernize.

MECHANICAL ADAPTABILITY

This chassis lends itself to cabinet adaptation with a degree of facility comparable to its electrical flexibility. Usually it will be easier to retain the standard metal panel which will be mounted flush behind the wood panel in the front of the cabinet. The metal provides an additional amount of shielding, and holds the dial card. Thus the entire tuning and amplifying unit can be readily removed from the cabinet for calibrating on the service bench. Extension shafts make it possible thus to mount the chassis behind the main cabinet panel. These shafts are long enough to provide a $\frac{1}{8}$ -inch clearance between the metal and wood panels when it is desired to float the chassis. In such instances, the holes in the wood panel must, of course, be oversized so that the extension shafts are adequately

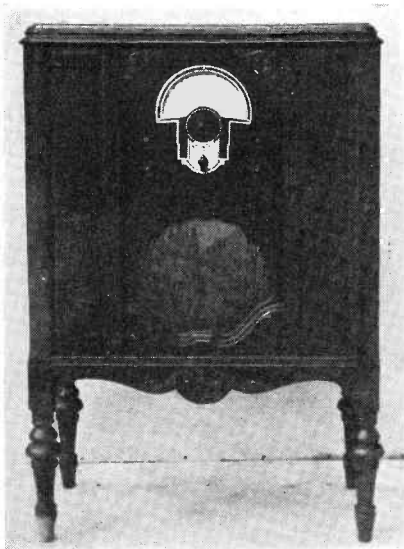


Fig. 4. Front view of the Philco, with the original investment saved by modernization.

cleared. (It will seldom be necessary to float the chassis, due to the fact that the tendency to acoustic feedback has been considerably reduced by mounting the tuning catacomb itself on soft rubber.)

Where it is desired to eliminate the metal panel, the dial card is mounted directly on the wood panel. Methods of doing this were described in the preceding article and will not be repeated here. When the wood panel is not thicker than $\frac{3}{8}$ inch, the extension shafts can be eliminated by countersinking on the rear of the panel for the collar nuts.

In many instances, as will be observed in one of the two modernization jobs to be described in this article, the width of the original panel opening is insufficient to accommodate the outside controls as laid out in the original design. These are controls A and B in Fig. 1, which is a general panel layout

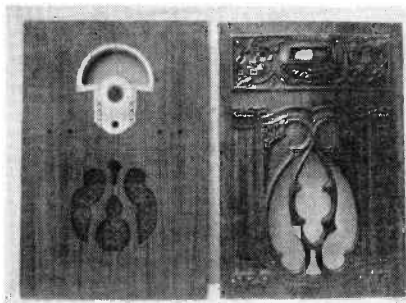


Fig. 5. Showing the panel changes in the RCA RE-17.

with all dimensions referred to a center line and the base of the chassis. In such cases, controls A and B—the main sensitivity control and tone-control-on-off-switch, respectively—are mounted at C and D or thereabouts. We write “thereabouts,” because flexibility is permissible here if a slightly different distribution of the knobs will result in a more pleasing appearance in conformity with the shape of the opening.

MODERNIZING THE PHILCO 65

This was a highly popular receiver of the pre-all-wave days, and represented an investment that few owners are prepared to throw away. Such prospects are usually people of discrimination who will be satisfied with nothing short of as good performance in the light of today's standards, as their old set gave them in accordance with the criteria of 1930. In other words, if they were to buy a set today, they'd expect to pay in the neighborhood of \$150 for it. They hesitate perhaps for two reasons—they may not have the \$150 and refuse to accept inferior performance, or they may be discouraged by the negligible turn-in value of their present

receiver which cost plenty a half decade back. This is the Service Man's cue!

The Philco 65 is one of the most simple modernization jobs, as it presents no electrical or mechanical problems. The chassis and speaker are first removed, followed with the panel. No difficulties will be encountered here, as it is held in place with screws. The old panel was used as a template for cutting a new speaker opening in the plywood panel. The escutcheon opening and control holes were cut in accordance with Fig. 1, controls A and B being mounted respectively at C and D. Fig. 2 shows the old and new panels. The new panel was stained to the desired depth of dark walnut—the stain being rubbed in with a cloth. An application of elbow grease and floor wax finished the panel with a professional touch. The original tapestry was glued behind the speaker opening and the panel mounted in the cabinet. The height of the top of the shelf was used as a base line (bottom of chassis) in cutting and drilling in accordance with Fig. 1. It was not necessary to float the chassis, and the metal panel was not used.

The electrical installation was simplicity itself, as the entire Browning-35 chassis was used with a new ten-inch Wright-DeCoster speaker. The old speaker could have been retained but it proved defective in several respects and it was judged equally economical to replace it, particularly with the assurance of slightly better reproduction.

Fig. 3 gives a good idea of the mechanical layout after modernization, while Fig. 4 is a front view of the Philco-Browning, vintage 1936.

THE RCA RE17

This receiver presented a somewhat different problem due to the fact that it is a radio-phono combination. Need-

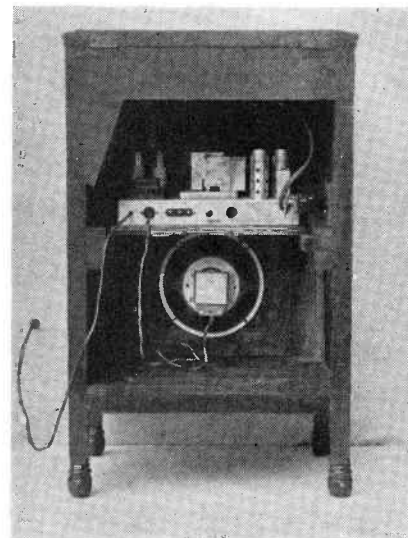


Fig. 6. Rear view of the RCA radio-phono combination following modernization.

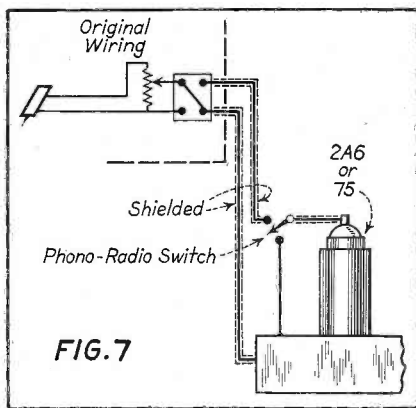


Fig. 7. Circuit diagram showing the phono input to the grid of the second detector tube.

less to say, however, the complications were of a very minor nature.

The chassis and speaker were first removed, but the turntable, pick-up, phono volume control, transformer and cable were left as originally installed. Removing the old panel presented some difficulties. There are two large vertical mounting strips for the RCA chassis in the front of the cabinet. These strips are both screwed and glued in place, and, in addition, have tongues which fit into slots along the sides of the cabinet. The screws are first removed, following which the strips are pried loose with a hammer and screw-driver. It is then a simple matter to remove the panel. The ornate old and the modernistic new panels are shown in Fig. 5. As will be observed, an entirely different speaker opening was designed and cut with a fret or scroll saw. The old grille cloth was used. The panel was finished in exactly the same way as in the case of the Philco. The standard Broadway layout was feasible in this case—i.e., with the four control knobs in a horizontal line.

Once again the top of the shelf was used as a base line in cutting the escutcheon opening and drilling the control holes.

A slight but practically unnoticeable space will exist between the center of the panel and the molding, due to the fact that the original panel, made out of pressed wood, had a slight bulge or curvature.

Once again it was deemed desirable to install a new speaker. The rear view of the completed conversion is shown in Fig. 6. The chassis is not floated. A shielded lead was used in wiring the phono-radio switch in accordance with the diagram of Fig. 7. Fig. 8 is the front view of the finished job. The results are on a par with the appearance—excellent phonograph reproduction and thoroughly modern radio reception.

TO SALVAGE OR NOT TO SALVAGE?

In consideration of the fact that in both conversions described in this article new speakers were installed, it might be well to mention that substitution may be determined by factors other than the actual condition of the original speaker. In some instances it may be more economical to install a new speaker even when the old one is in perfect condition and capable of good fidelity. Such is often the case when the original speaker has a self-excited field. A separate filter system for the receiver must then be installed, which will include a 70-milliamper, 30-henry choke plus a series resistor capable of carrying the same current and of the correct value to bring the resistance of the choke-resistor combination, which is substituted for the speaker field, to 1800 ohms. An impedance-matching transformer is also a possible additional expense.

TOUCH UP THE CABINET

It follows as a matter of course that



Fig. 8. Modern in every respect—avc, all-wave, etc.; at a price that few customers will kick about.

the Service Man should touch up minor cabinet blemishes as part of his modernization job. In many instances a good rubbing down with oil, followed with the application of furniture wax will be all that is necessary. Scratches that are too deep to be rendered invisible with oil and wax should be filled in with burning-in shellac, which comes in the form of sticks. This is applied with a scalpel—a knife with a very flexible blade. Heat the scalpel with an alcohol lamp and melt a little of the shellac on to it by contact. This is worked into the scratch. (If the scratch is through to the wood, stain should first be applied with a camel's hair brush.) When the scratch is filled up, work it smooth with the hot blade. Blend it in with an oiled cloth dipped in powdered pumice, following the grain of the wood. Finally, polish.

(To be continued)

CRYSTAL-OSCILLATOR TEST CIRCUIT

See Front Cover

IT is a well-known fact that a crystal oscillator maintains a more constant frequency than any other device known. For accurate work, therefore, a crystal oscillator would prove to be ideal were it not for the fact that the use of a crystal immediately places a restriction on the oscillator circuit; i.e., it must be fixed tuned.

Yet an accuracy of two parts in one million is possible with a comparatively simple crystal oscillator, so that its use is very desirable. But how obtain more than the one fundamental frequency?

There is shown on the front cover the circuit of the RCA crystal-controlled oscillator which, because it is designed to be rich in harmonics, may be used to check frequencies from 100 to 20,000 kc, in 100-kc steps, and from 1,000 to 50,000 kc, in 1000-kc steps. Odd frequencies can be checked by beating.

A crystal having a fundamental frequency of 100 kc is used in conjunction with a type 955 Acorn triode. When the switch S-1 is thrown to the "LO" position, the grid and plate coils L-1 and L-2 respectively are tuned close enough

to 100 kc so that the crystal is excited at its fundamental frequency. When the switch is thrown to the "HI" position, the plate coil L-3 is thrown into circuit and a portion of the grid coil L-1 is shorted. In this case the grid and plate circuits of the tube are tuned to an even harmonic of the crystal (1,000 kc) and the tube is excited at this frequency. Sufficient bias is placed on the grid of the tube to make it rich in harmonics.

It will be seen that the circuit is so arranged that the oscillator may be operated directly from a 110-volt a-c line.

General Data . . .

RCA Victor Model C 15-3 (Continued from October SERVICE)

A general circuit description of the RCA Model C 15-3 appeared in the October issue. Now we continue with the servicing data—alignment, etc.—based on the use of Cathode-Ray Oscillograph equipment.

For those not having oscillographic equipment, data on alignment of this receiver is included at the end of the article.

ALIGNMENT PROCEDURE

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied, the normal performance of the instrument will be obtained.

Circuits aligned by use of Cathode-Ray equipment will be as near to perfection as possible, hence this method is to be preferred in all cases. Alignment by other methods is oftentimes an approximation unless extreme care is taken and a good deal of time expended. The oscillographic method is particularly advantageous for trimming the i-f tuned circuits to obtain the utmost in tone quality and at the same time the maximum of selectivity. Procedure to be followed when using a Cathode-Ray Oscillograph is therefore given in detail. Should this type of equipment be unavailable, a substitute indicator may be used, the procedure being the same but without the sweeping operations.

EQUIPMENT

The instruments required for placing

this receiver in proper alignment should consist of a Cathode-Ray Oscillograph, a Full-Range Oscillator, a Frequency Modulator, a Tuning Wand and an Alignment Tool. The Cathode-Ray Oscillograph is to be used as an output indicator to precisely show when the circuits are correctly aligned. The Full-Range Oscillator is required as the source of standard alignment signals at the various frequencies. Visual alignment is made possible through use of the Frequency Modulator, which in conjunction with the Oscillograph and Oscillator, causes the characteristic wave shape of the circuit under test to be formed on the Oscillograph screen. Adjustments must be made with an insulated screw driver, the Alignment Tool fitting such a requirement. The necessity for alignment and direction of required change may be tested with the Tuning Wand.

I-F TRIMMER ADJUSTMENT

Six trimmers are associated with the three i-f transformers. Their locations on the chassis are shown by Fig. 1. Each must be aligned to a basic frequency of 460 kc. The last i-f transformer should be adjusted first, the one preceding it second and the operation carried through successive stages until the first transformer has been aligned. For such a process, it is necessary to feed the output of the Full-Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The most convenient point

for connection of the Oscillograph is at the control grid of the 6C5 first audio tube, with the vertical "Hi" input terminal attached to the grid connection and the "Gnd" to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as illustrated in Fig. 2. A .001-mfd capacitor installed in series with the Oscillator "Ant." output lead will prevent the voltage constants of the stage being aligned from becoming upset. Proceed further as follows:

(a). Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver volume control to maximum and the range switch to Band "A." Tune the station selector to a point where no interference is caused by local stations or the local oscillator, removing the 6J7 tube if necessary. Turn the Oscillograph vertical "A" amplifier to "On" and advance the vertical gain control to its maximum position. Set the horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a trace completely across the screen. Have the timing control adjusted to "Int."

(b). Attach the output of the test Oscillator to the control grid cap of the second i-f tube (6K7) and chassis ground. Tune the Oscillator to 460 kc, having its modulation switch turned to "On." Regulate the output control until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph frequency and range controls to give the desired number of cycles. Cause the image formed to stand still on the screen by manipulation of the "Sync." control. Use as low a signal output from the Oscillator as can be accurately observed at the Oscillograph. Then tune the two trimmers C-44 and C-45 of the third i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition, the transformer will be sharply resonated to 460 kc.

(c). The Frequency Modulator should then be placed in operation and interconnected with the Full-Range Oscillator by means of the shielded patch cord provided. Fig. 2 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off." Change the timing (Sync.) control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then shift the tuning of the Oscillator, so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become coincident at their highest points. These curves will be found to occur at an Oscillator setting of approximately 540 kc. They will be

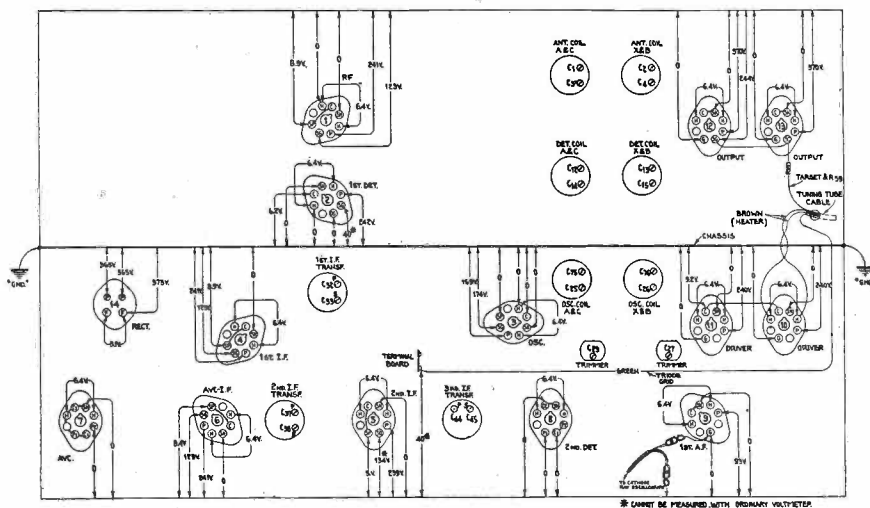


Fig. 1. Showing the location of coils, transformers, and sockets with voltage values for RCA Victor Model C 15-3.

identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with these requirements and to make them remain motionless on the screen. This will require a setting of approximately $\frac{1}{2}$ clockwise rotation of the frequency control. The trimmers C-44 and C-45 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d). Leaving the equipment connected and adjusted as above, change the Oscillator output to the control grid cap of the first i-f tube (6K7). Adjust the two trimmers C-37 and C-38 of the second i-f transformer until the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude.

(e). Change the test Oscillator output to the control grid of the first detector tube (6L7) without disturbing the connections and adjustment of the other apparatus. Then align the trimmers C-32 and C-33 of the first i-f transformer to produce waves of maximum coincidence and maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the over-all tuning characteristic of the i-f system.

ANTENNA, DETECTOR AND OSCILLATOR

For Bands A and X, adjustments must be made at the high and low frequency ends of the range. On Bands B and C, alignment is required only at the high frequency end. Band D is permanently adjusted during manufacture, hence no alignment will be necessary in this range. Locations of the various antenna, detector and oscillator trimmers are shown on Fig. 1.

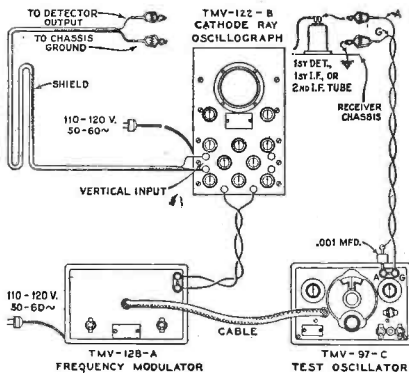


Fig. 2. Alignment apparatus connections.

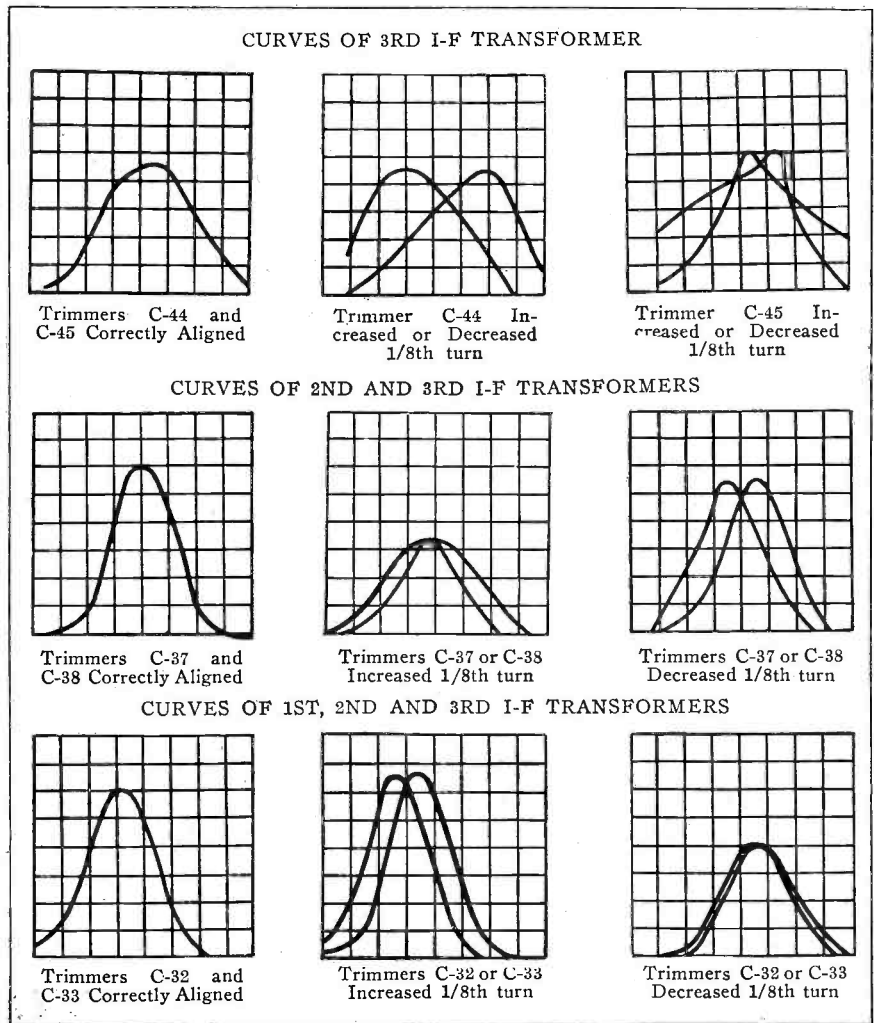


Fig. 3. Cathode-Ray images for the i-f amplifier.

The test Oscillator should be removed from connection with the i-f system and its output attached to the antenna-ground terminals of the receiver. No changes are to be made in the attachment of the Oscillograph at the second detector. During the adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Such procedure will obviate apparent broadness of tuning which would result from avc action on a stronger signal. The sequence of alignment should be Band A, Band X, Band B and Band C. Proceed with the adjustments as follows:

CALIBRATION

Set the receiver range switch to Band A and rotate the station selector until the tuning capacitor plates are in full mesh (maximum capacity). Then move the main dial pointer until it points exactly to the horizontal line at the low

frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

BAND A

(a). With the receiver range switch on its Band A position, tune the station selector until the dial pointer is at a reading of 1720 kc. Adjust the Oscillator to 1720 kc (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-25, C-14 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. Then shift the timing control to "Ext." and place the Frequency Modulator into operation with its connections to the Oscillator and Oscillograph as shown on Fig. 2. Re-

tune the test Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-25, C-14 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(b). Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to 600 kc. Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator until the two similar forward and reverse waves appear on the screen. It is advisable to shift the Oscillator to its 200-400 kc range and use the third harmonic of the generated signal in order to obtain the desired range of sweep for this adjustment. The trimmer C-23 should then be adjusted until a point is reached where the waves have the greatest amplitude. It will be unnecessary to rock the tuning condenser for this operation inasmuch as the Frequency Modulator is automatically producing the same effect. After completing this adjustment, the trimmer C-25 should be realigned as in (a) to correct for any change in the oscillator high frequency tuning which has been caused by the adjustment of C-23.

BAND X

(a). Disconnect the Frequency Modulator and tune the test Oscillator to a frequency of 400 kc. (Modulation "On"). Place the receiver range switch in its Band X position and turn the station selector until the dial pointer reads 400 kc. Adjust the Oscillograph timing control to "Int." Then align each of the trimmers C-26, C-15 and C-4 to the point producing maximum output at the Oscillograph. Place the Frequency Modulator in operation and attach it to the Oscillator in the normal manner. Change the Oscillograph timing to "Ext." Increase the frequency of the Oscillator (modulation "Off") until the two waves appear and become coincident at their highest points, *approximately at 462 kc.* They may be made to remain stationary on the screen by manipulation of the Oscillograph range switch and frequency control. Re-adjust the three trimmers C-26, C-15 and C-4 to give maximum amplitude and complete coincidence of the waves.

(b). Change the test Oscillator so that it delivers a signal of 150 kc with the Frequency Modulator disconnected.

Tune this signal on the receiver which has previously been set to Band X, disregarding the dial reading at which the signal is best received. Then interconnect the Frequency Modulator with the Oscillator and retune the latter to the point at which the two similar waves appear on the screen. Adjust the trimmer C-27, for maximum amplitude of the wave images. Rocking of the tuning condenser will not be necessary as the Frequency Modulator duplicates such an operation. Repeat the alignment of C-26 as outlined in (a) to correct for any reflective error brought about by the adjustment of C-27.

BAND B

(a). Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of 6132 kc. Set the test Oscillator to this same frequency (Modulation "ON" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. Then adjust the trimmer C-76 to the point producing the maximum amplitude of the image. Two positions will be found on this trimmer which cause maximum amplitude. The one of least capacitance is correct and should be used. Check for the "image" signal, which will be received at 5212 kc on the dial if the adjustment of C-76 has been properly made. An increase in Oscillator output may be necessary for this test; however, its frequency should not be changed nor any trimmer adjustments made on the receiver.

(b). Return the station selector to the 6132-kc reading and align the detector and antenna trimmers C-13 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on Band B.

BAND C

(a). Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads 18,000 kc. Set the test Oscillator to this same frequency (Modulation "On" and Frequency Modulator disconnected), regulating its output to the level required for convenient observation. Adjust the trimmer C-75 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of "image" signal by tuning the receiver to 17,080 kc. The 18,000-kc signal of the Oscillator will be received at this point if the adjustment of C-75 has been properly made, using

the position of minimum capacitance giving maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image." *No adjustments should be made during this check.*

(b). Return the receiver tuning to 18,000 kc, realign C-75 if necessary, and then adjust the detector and antenna trimmers C-12 and C-1 for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on Band C.

BAND D

No adjustments are required on this band.

GENERAL ALIGNMENT NOTES

To align the receiver by other means than those explained in the above procedure will require the use of an output indicator and a suitable test oscillator. The output device should be connected at the receiver output, either to the voice-coil circuit or to the output transformer primary. Successive points of connection of the test Oscillator will be identical to those specified for Cathode-Ray alignment, the same test frequencies being used in each case. The process of sweeping the frequency of the test Oscillator with the Frequency Modulator will of course be omitted; instead, the trimmers throughout the system should be adjusted to produce maximum indication at the output. It will be essential to rock the tuning condenser for the low frequency adjustments of Bands X and A, but to cause maximum output rather than the type of indication afforded by the Oscillograph. The receiver volume control must be kept at its maximum setting and for each test, the Oscillator output regulated to maintain an indication which will be as small as possible. Under this condition, the receiver will be operating at maximum gain, but receiving only a weak signal of insufficient strength to cause appreciable AVC action. This requirement is of importance in either method of procedure, since the AVC will have a definite effect on the indication if a more intense input is used.

Crosley 124J

Impossible to align at 175 kc: Caused by first i-f transformer secondary winding being grounded or shorted. Replace. Also replace 27 oscillator tube and check twin speakers for correct phasing.

George F. Baptiste.

GENERAL DATA—continued

Grunow 6G Chassis

The Grunow 6G broadcast and short-wave chassis is used in receiver models 680 and 681, with speakers 8B4 and 108C5 respectively. It is a 6-tube, 115-volt, 50-60 cycle set, with three wave-band positions, avc, tone control and band-spread dial.

A 6A8 is used as mixer-oscillator, 6K7 as first i-f amplifier, 6H6 as second detector and avc, 6F5 as first audio amplifier, 6F6 as power output tube, and a 5Z4 as rectifier tube.

The three frequency ranges are divided as follows: Band A, 550 to 1750 kc; Band B, 1700 to 5680 kc; Band C, 5.4 to 18 mc.

CIRCUIT ALIGNMENT

Do not attempt to align the 6G Chassis without proper equipment. Alignment condensers are shown in Fig. 2—i-f condensers on top of the i-f transformers.

Coupling condensers of 200 mmfd, .25 mfd, and a 400-ohm resistor should be used when coupling oscillator to receiver during alignment as specified in the procedure.

The receiver should be aligned in a location free from local interference caused by motors—flashers—automobile

ignition, etc.) as high-frequency disturbances will cause difficulties when the short-wave section is being adjusted. (A screened room is to be recommended.)

DIAL SETTING

Turn dial knob until condensers are fully meshed. The dial pointer (hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 o'clock. The minute hand should be at 12 o'clock or in a vertical position.

I-F ALIGNMENT

Connect signal lead of test oscillator to grid of 6A8 (1st detector tube) through .25-mfd condenser. Connect the ground lead to the chassis.

Set dial pointer to 1400 kc and range switch on position "A."

Place test oscillator in operation at 490 kc or 465 kc (see note below). Turn receiver volume control and tone control to maximum.

Attenuate test oscillator output to lowest value, consistent with obtaining a readable indication on output meter.

Adjust four i-f trimmers, A1, A2, A3, A4, located on the i-f transformers on top of chassis (see Fig. 2) until maximum output is obtained. During alignment, maintain as low a value of

signal as will allow obtaining of accurate adjustment.

1400-KC ALIGNMENT

Connect signal lead of test oscillator through 200 mmfd condenser to antenna binding post.

Connect the test oscillator ground lead to the ground post of chassis.

Place test oscillator in operation at 1400 kc.

Turn dial pointer to 1400 kc.

Turn range switch to range "A."

Adjust broadcast oscillator trimmer A5, Fig. 2, to maximum output.

Adjust 1st Det. Trimmer (A6), Fig. 2, to maximum output.

600-KC ALIGNMENT

Place test oscillator in operation at 600 kc.

Tune in signal to maximum (this point does not have to be exactly at 600 kc dial setting).

Adjust the 600 kc padding condenser (A7) (which is on top of chassis to the rear of variable condenser) in direction of signal increase. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

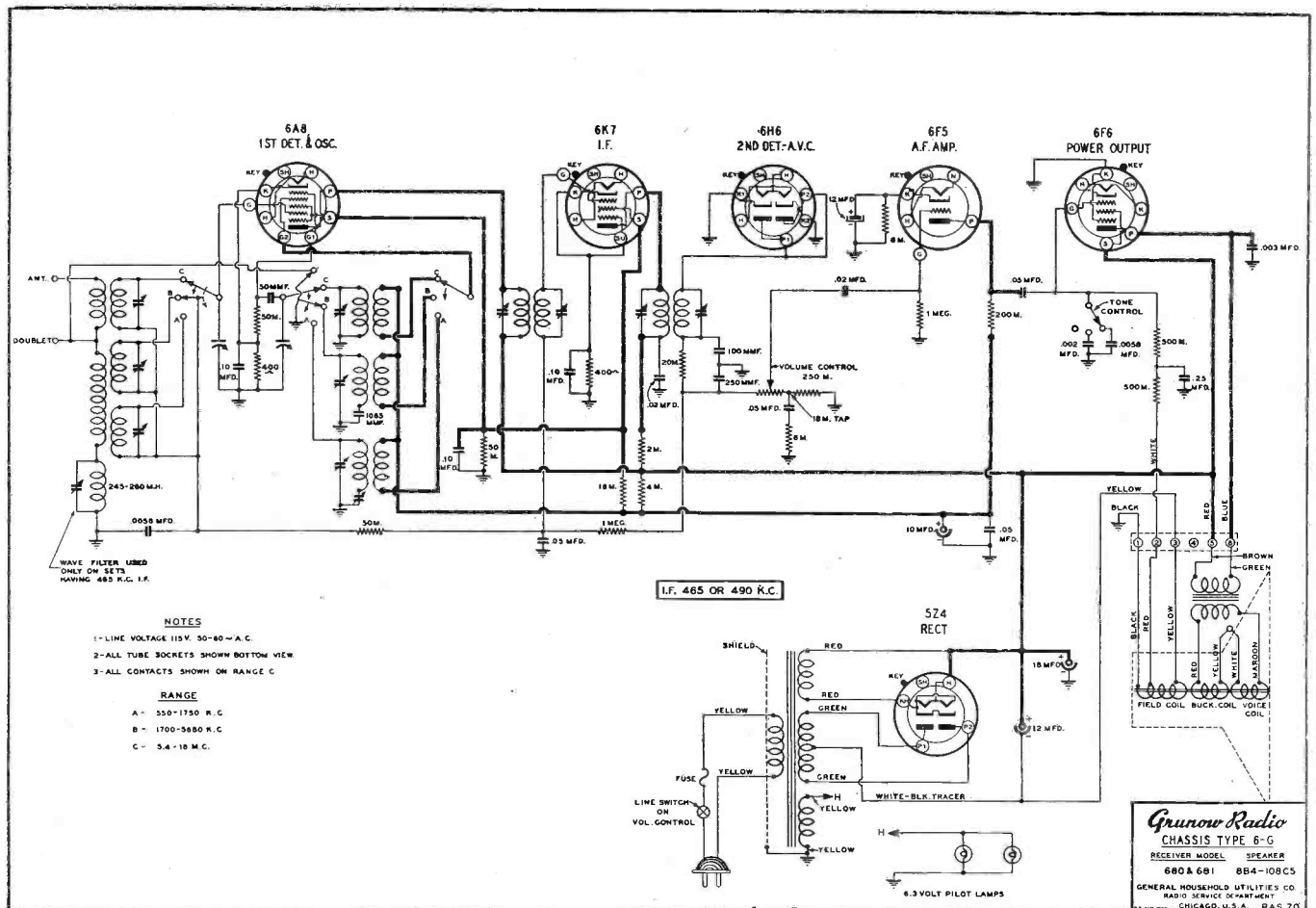


Fig. 1. Diagram of the Grunow 6G chassis.

GENERAL DATA—continued

Recheck 1400-kc Alignment.

5-MC ALIGNMENT

Set range switch at "B."

Place test oscillator in operation at 5 mc.

Turn dial pointer to 5 mc.

Adjust set oscillator trimmer (A8) to maximum output.

Adjust detector trimmer (A9) to maximum output.

Check dial setting at 1800 kc.

18-MC ALIGNMENT

Connect signal lead of test oscillator through 400-ohm resistor to antenna binding post of chassis.

Connect the ground lead to ground terminal of chassis.

Set range switch to range "C" and turn dial pointer to 18 mc.

Place test oscillator in operation at 18 mc.

Adjust set oscillator trimmer (A10) to maximum output.

Adjust detector trimmer (A11) to maximum output.

On the 18-mc alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for alignment point, that is, the setting giving most capacity or the point at which the trimmer screw is farthest in. Check dial setting at 6 mc.

I-F PEAKS

Due to interference caused by commercial code stations in some locations, it has been necessary to use two i-f frequencies on this receiver, one of 490 kc where code interference is in the neighborhood of 455 kc, and the other where the interfering stations are operating in the 500-kc band, an i-f of 465 kc is used.

The i-f frequency of the receiver is stamped on the rear of the chassis, and if there is any doubt as to i-f peaking, it is only necessary to apply a variable i-f signal to the i-f amplifier, and maximum output will indicate resonance or frequency at which the i-f's were peaked.

To further overcome this form of interference, sets peaked at 465, also incorporate a wave filter in the antenna

circuit. This filter should be tuned to the same frequency as the i-f transformers. Tuning is accomplished after the set has been completely aligned by applying the i-f frequency signal through to a .0002-mfd condenser to the antenna binding post of the receiver, and tuning the wave filter condenser, (A12) (located on the right hand side of the chassis) so that the incoming signal is at minimum output.

In other words, apply a strong 465 kc signal to the receiver antenna post through the .0002-mfd condenser, and tune wave filter so that the output meter indicates minimum.

Silvertone Models 1922A, 1932A, 1982A and 1992A

These Silvertone Models are 6-tube battery-powered superheterodynes, having a broadcast and short-wave range. A filament ballast tube type 1G1 is used to maintain the filament voltage at its proper value when the receiver is supplied by a 3-volt "A" block or an air cell. If a 2-volt storage battery is to be used, the ballast tube should be replaced by a 4-prong plug having its filament prongs connected together.

THE AVC CIRCUIT

The 230 avc tube is used as a diode with its plate connected to one of the filament prongs, so that the usual grid acts as the diode plate. A portion of the i-f signal is applied to the tube through C-13, as shown in Fig. 1. The resulting diode current, flowing through R-6, creates a voltage drop which is applied to the control grid of the 1C6 and 1A4 tubes to secure avc.

The tubes and their functions are as follows: 1C6, oscillator-translator; 1A4, i-f; 232, detector; 230, avc; 950, output; 1G1, ballast.

ALIGNMENT PROCEDURE

During all of the alignment procedure, the volume control should be turned all the way on and the tone control should be turned all the way to the right to its "brilliant" position. The ground lead of the test oscillator is to be connected to the chassis through a .1-mfd condenser. This prevents shorting of the grid bias of the tubes. The other lead of the test oscillator is to be connected in the manner described in the procedure. Where connection is made to a control-grid cap, it is important to leave the grid clip attached to the grid cap and to leave the tube shields in place. No attempt should be made to "kill" the oscillator section of the 1C6 during the alignment.

The output from the test oscillator

always should be kept at the lowest possible value that will give a satisfactory output reading. During the r-f alignment, the coupling between the test oscillator and the antenna lead of the receiver should be made as loose as possible. (The antenna lead and the oscillator lead separated.) If the test oscillator has a variable control for its power output, turn this control to its high position and then decrease the signal input to the receiver by decreasing the amount of coupling between the test oscillator and the receiver's antenna lead. If an actual antenna is not used, and is replaced by a condenser or resistor, as described in the procedure, the input to the receiver should be kept low by decreasing the power output from the test oscillator.

When peaking the *antenna* and *translator* trimmers, the variable condenser should be "rocked" back and forth a degree or two while the trimmer is being adjusted. This should *not* be done when peaking the oscillator trimmers. In this case, the variable condenser is turned so that the plates are completely out of mesh and left in this position during the adjustment. When adjusting the oscillator trimmers, if it is found that two peaks can be obtained, use the one in which the trimmer is screwed further *out* (less capacity). When adjusting the antenna and translator trimmers, if two peaks are found, use the adjustment in which the trimmer is screwed *in* furthest. Note that this is exactly *opposite* to the procedure for the oscillator trimmers.

SEQUENCE OF ALIGNMENT

1. Align i-f amplifier.
2. Align broadcast band, Band A.
3. Align short-wave band, Band B.

I-F ALIGNMENT

1. Set the test oscillator to 175 kc and connect its output lead to the control grid cap of the 1C6 tube.
2. Peak the i-f input transformer. This is the square can unit on top of the chassis.
3. Peak the i-f output transformer secondary. This is the round can unit with the single adjusting screw mounted at the top rear of the chassis.
4. Peak the i-f output transformer primary. This trimmer adjustment is C-21 in the diagram of Fig. 2.
5. It is advisable to repeat the alignment for greater accuracy.

BROADCAST R-F ALIGNMENT; BAND A

1. Loosely couple the output of the test oscillator to the antenna lead of the

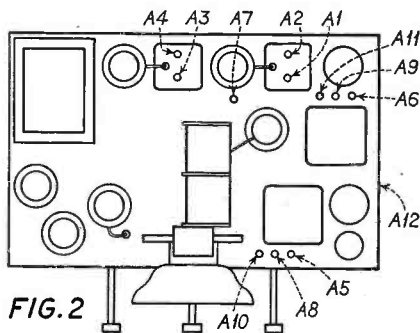


FIG. 2

Chassis layout and trimmer locations, Grunow 6G.

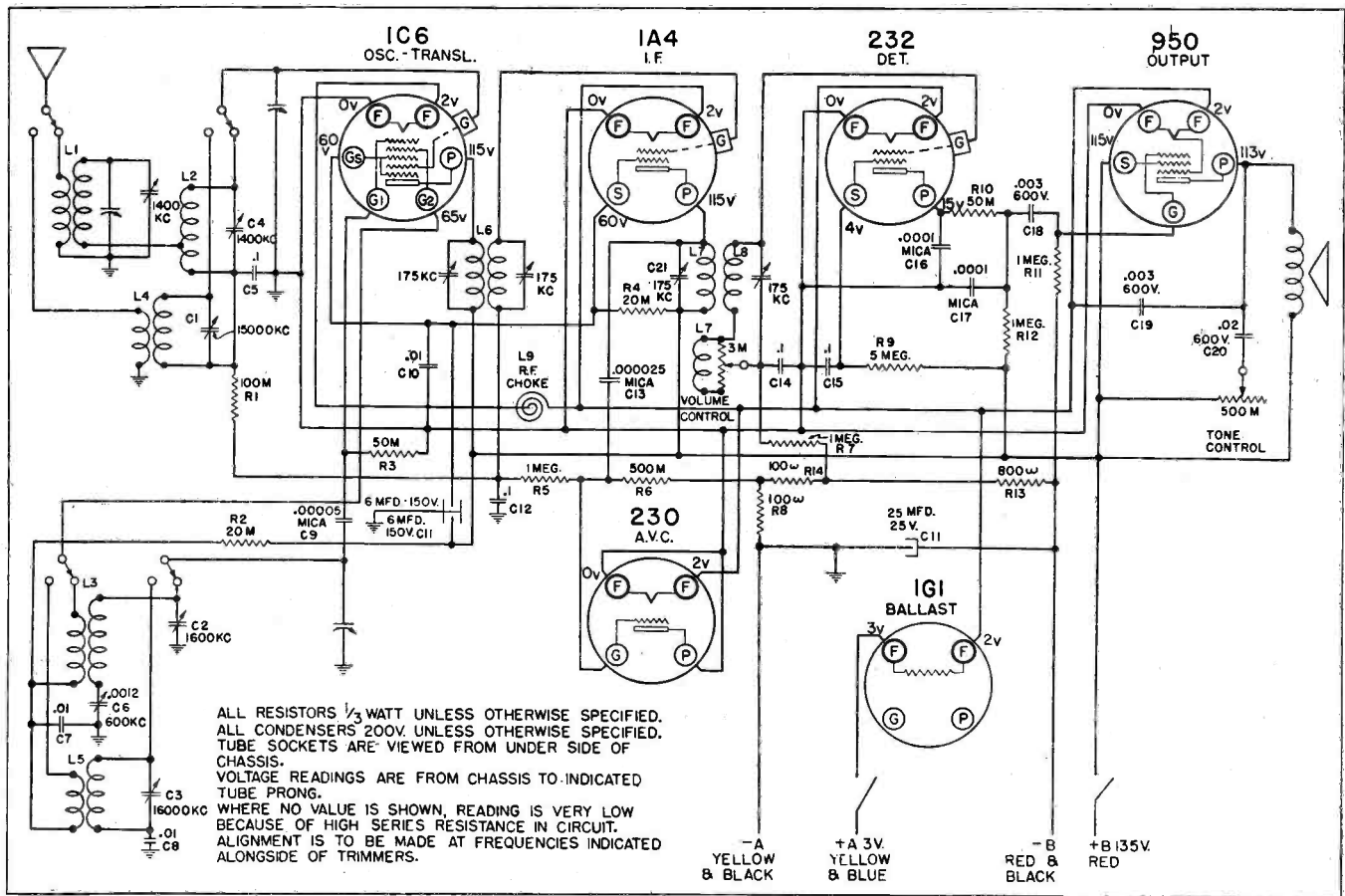


Fig. 1. Circuit used in Silvertone Models 1922A, 1932A, 1982A and 1992A.

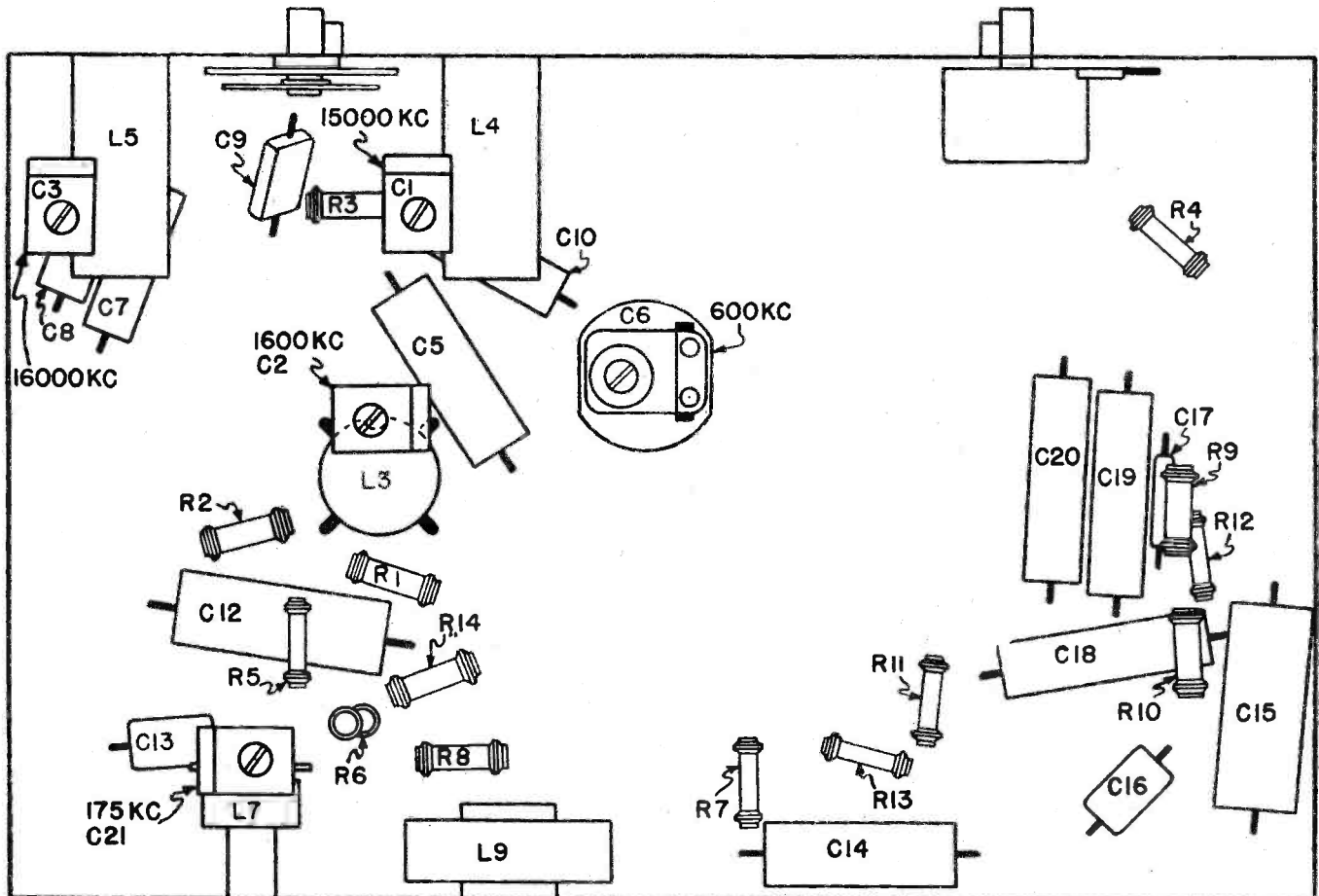


Fig. 2. Location of parts and trimmers on chassis of Silvertone models listed above.

receiver, leaving the antenna connected. If it is impractical to use an actual antenna, the test oscillator can be connected, in series with a .00025-mfd condenser, directly to the antenna lead of the receiver.

2. Set the test oscillator to 1,600 kc. Open the variable condenser plates all the way and adjust C-2, the Broadcast oscillator trimmer, for maximum output.

3. Set the test oscillator to 1,400 kc and tune in its signal. Peak the Broadcast antenna and translator trimmers. The antenna trimmer is the one on the variable condenser section nearest the dial. The translator trimmer is the one in the round can unit mounted next to the square can i-f unit on top of the chassis.

4. Set the test oscillator to 600 kc and tune in its signal. Then adjust C-6, the Broadcast oscillator padder. The variable should be "rocked" back and forth a degree or two during the adjustment.

5. Repeat the 1,600- and 1,400-kc adjustments.

SHORT-WAVE R-F ALIGNMENT; BAND B

1. Loosely couple the test oscillator to the antenna lead of the receiver, leaving the antenna connected. If it is impractical to use an actual antenna, the test oscillator can be connected, in series with a 400-ohm resistor, directly to the antenna lead of the receiver.

2. Set the test oscillator to 16,000 kc. Open the variable condenser plates all the way and peak C-3, the Short-Wave oscillator trimmer.

3. Set the test oscillator to 15,000 kc and tune in its signal. Peak C-1, the Short-Wave translator trimmer.

Raytheon 6Q7 Duo-Diode Triode

Raytheon has just announced a new combination type metal tube which has been designated type 6Q7.

Type 6Q7 is a duo-diode triode with circuit applications corresponding to those used with the type 75 glass tube. Reference to the characteristics of the new Raytheon 6Q7 shows noteworthy



The 6Q7 Duo-Diode Triode.

changes in the triode section. The amplification factor is 70 and the plate resistance 59,000 ohms—both lower than in the 75. The mutual conductance of the 6Q7 is slightly higher.

The result of these changes is a definite improvement in the signal handling capability of the 6Q7.

The triode section is a high- μ tube designed for resistance coupling. The coupling resistance may be any value up to approximately one quarter megohm.

The two diode units are independent of each other and the triode unit except for the common cathode sleeve. The diode units may be used either as a half-wave or full-wave rectifier, or a half-wave rectifier with the other unit used for delayed avc.

Silvertone Models 1904, 1906, 1914, 1954, 1964

Reducing Volume to Zero: The most common cause for failure of the volume control to reduce the volume to zero is slippage of the volume control coil on its shaft. Causes of this trouble are:

1. A faulty 6C5-G avc tube will make it impossible to reduce the volume to zero. Try other tubes in the socket. After the tube has been replaced, bring the coil to its zero setting.

2. A less likely cause of the same trouble is leakage between B plus and the 6A7 grid return lead. This can be overcome by pulling this grid-return lead up away from the other wiring.

3. In unusual cases where there is a powerful broadcasting station very close to the receiver, a small shield (Part R13352) should be fastened by means of a nut, to the mounting screw for the fixed coil of the volume control. After the coil has been adjusted to minimum volume, additional improvement can be had by very slight bending of the shield toward or away from the fixed coil. The addition of this shield will be found necessary only in extreme cases.

Reducing Image Response: Any difficulty with whistles due to image response can be minimized or entirely eliminated as follows:

1. Examine the connections of the broadcast antenna coil primary. If the inside lead of the primary is connected to ground, and the outside of the winding connected to the wave switch, the correction for image has already been made in production and nothing more should be done.

2. If the inside of the winding connects to the wave switch and the outside to ground, remove the connections and connect the inside of the winding to ground. The connection to the outside of the winding should be changed as described in the following paragraph:

3. Remove the wire that ran from the broadcast antenna coil primary to the wave switch. Run a wire from the terminal of the outside of the primary winding, down through the hole that is alongside of the electrolytic condenser, across the top of the chassis, down through the power transformer mounting slot, to the wave switch terminal from which the original lead was removed.

4. It is not necessary to re-align circuits.

Mounting Screw Short: Some trouble may possibly be encountered due to one of the chassis mounting screws coming into contact with the 22-ohm resistor, R13. This trouble was quickly discovered in production and corrected by mounting the resistor terminal board differently. However, a few sets may have been shipped in which the possibility of the trouble exists.

RCA Models Using "ARB"

The automatic residual-bias system described last month is used in the following RCA receivers: C8-17; C9-4; C11-1; C13-2; T8-16; T10-1 and T-10-3.

6Q7 CHARACTERISTICS

Heater Rating

Voltage	6.3 volts
Current	0.3 ampere

Triode Unit—Class A Amplifier

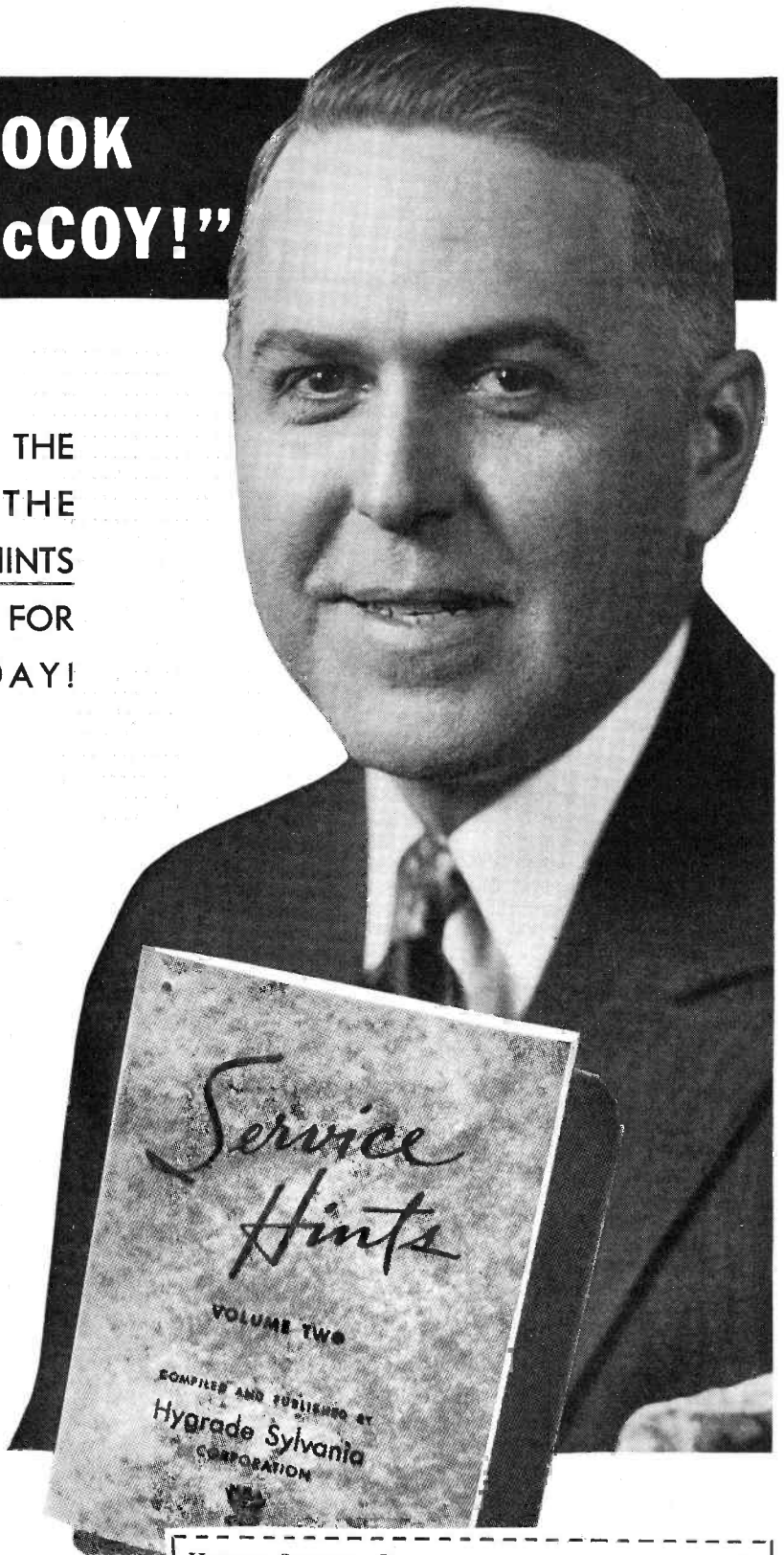
Operating Conditions and Characteristics	
Plate	250 volts
Grid	-3 volts
Plate Current	1.2 ma
Amplification Factor....	70
Plate Resistance	59000 ohms
Mutual Conductance....	1200 mmhos

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INTERMEDIATE-FREQUENCY PEAKS FOR 1936 RECEIVERS

Atwater-Kent I-F Peaks

The i-f peaks listed in the accompanying table are for the new model Atwater-Kent receivers.

Model	I-F Peak
285 Q	450
286	472.5
317	472.5
337	472.5
356	472.5
385 Q	264
415 Q	450
435	450
475	264
545	450 or 472.5
625 Q	264
649	472.5
735	264
776	264
856	264
976	264

Bosch I-F Peaks

The models and i-f peaks for the new United American Bosch receivers are given in the accompanying table.

Model	I-F Peak
04	t-r-f
05	465
376	456
385	463
386	463
402	456
420	456
430	450
440	456
450	450
460	456
470	456
480	456
505	465
510	465
510 E	465
575 F	465
575 Q	465
585 Y	465
585 Z	465
595 M	465
595 P	465

Fada I-F Peaks

The following table of i-f peaks is for the new Fada receivers:

Model	I-F Peak
150	456
155	456
157	456
160	456
166	175
170	456
190	456
192	456
1462	456

General-Electric I-F Peaks

The following table gives the i-f peaks for the new General Electric receivers:

Model	I-F Peak
A-53	465
A-63	465
A-64	465
A-65	465
A-67	465
A-70	465
A-75	465
A-82	465
A-87	465

Grunow I-F Peak Table

The i-f peaks for the new Grunow receivers follow:

Model	I-F Peak
470	465 or 490
580	465 or 490
640	465 or 490
641	465 or 490
670	455
671	455
680	465 or 490
681	465 or 490

RCA Victor I-F Peak Table

The i-f peaks for the new models of the RCA Victor receivers are given in the following table:

Model	I-F Peak
BC 6-4	460
BC 7-9	460
BT 6-3	460
BT 6-10	460
BT 7-8	460
C 6-2	460
C 8-15	460
C 8-17	460
C 9-4	460
C 9-6	460
C 11-1	460
C 13-2	460
C 15-3	460
D 22-1	460
T 4-8	460
T 4-8A	t-r-f
T 4-9	460
T 4-9A	t-r-f
T 4-10	t-r-f
T 5-2	460
T 6-1	460
T 6-9	460
T 8-14	460
T 8-16	460
T 10-1	460
T 10-3	460

Silvertone I-F Peaks

The following table gives the i-f peaks for the new Silvertone receivers:

Model	I-F Peak
603	460
604	445
1904	175
1904A	175
1906	175
1914	175
1920	480
1922A	175
1923	175

Model	I-F Peak
1925	450
1926	480
1932A	175
1933	175
1935	450
1936	175
1954	175
1964	175
1964A	175
1980	480
1982A	175
1983	175
1985	450
1992A	175
1993	175
1995	450
1996	175

Sparton I-F Peak Table

The following table gives the i-f peaks for the new Sparton receivers:

Model	I-F Peak
506	456
594	456
616	345
616 X	345
666	345
666 X	345
716 X	456
766	456
766 X	456
766 XP	456
766 XS	456

Stewart-Warner I-F Peak Table

The following table includes the models and i-f peaks for the new Stewart-Warner radio receivers:

Model	I-F Peak
R-134	456
R-136	456
R-137	456
R-138	456

Stromberg-Carlson I-F Peaks

The i-f peaks for the new Stromberg-Carlson radio receivers.

Model	I-F Peak
58	465
62	465
63	465
70	260-370
82	465
83	465
84	465

Wells-Gardner I-F Peaks

The i-f peaks given in the following table are for the Wells-Gardner sets:

Model	I-F Peak
ODM	456
5 G	175
6 S	175
7 G M	456
7 H	456
7 J	456

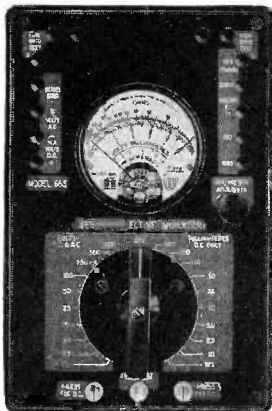
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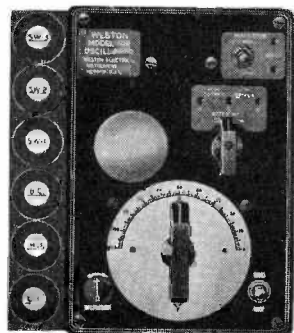


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1. Neon short check while tubes are hot.
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4. Individual tests on single electrodes—thus covering combination and double tubes.
5. Designed for both counter and portable use.
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You need this new Model 770 Tube Seller . . . just as you need these other Weston instruments for profitable servicing. They afford a profitable and *permanent* investment for those building a *permanent* business in radio. Get the facts on Weston instruments. Send the coupon today . . . Weston Electrical Instrument Corporation, 604 Frelinghuysen Avenue, Newark, New Jersey.

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AUDIO SYSTEM

Hudson-RCA Victor Model H-6

The schematic of the electrical circuit is shown in Fig. 1. From this diagram it may be seen that six tubes are incorporated in the basic superheterodyne circuit. In sequence, there is an r-f stage, a dual first detector-oscillator stage, a single i-f stage, a second detector audio amplifier avc stage, and a pentode output stage. The power supply system contains a mechanical interrupter and an 84 rectifier. The following circuit features are of particular importance:

NOISE FILTER

Reduction of ignition interference and similar disturbances is brought about by a filter arrangement in the antenna input circuit. This filter is a "band-pass" type, having an acceptance band between 540 kc and 1600 kc, and sharply defined cut-off below and above these two limits. Primary to secondary capacity coupling in the first r-f transformer has been minimized to further suppress interference.

TUNED CIRCUITS

There are seven resonant circuits in the radio-frequency end of the re-

ceiver. The r-f, first detector and oscillator grid circuits are tuned by a three-gang tuning condenser. The remaining tuned circuits consist of the primary and secondary windings of the i-f transformers which are resonated by trimmers to a nominal frequency of 260 kilocycles.

DETECTION-AVC

Detection takes place as a result of the rectifying action of the diodes of the 6B7 tube and develops a current through resistors R-7 and R-17. The d-c voltage drop in the resistors R-7 and R-17 due to the detected signal is used for automatically regulating the control grid bias of the r-f and first detector stages. The amplification of these stages thus becomes dependent upon the signal's strength. This process (avc) compensates for fading signals and reduction of signals due to change of antenna direction, shielding effects of buildings, bridges, etc. A smaller portion of the d-c voltage obtained by detection is tapped from the juncture of R-7 and R-17 and carried to the control grid of the i-f stage. This voltage likewise furnishes automatic volume control.

The audio and d-c components of the detected signal are selected from the manual volume control resistor (R-17) by its movable arm and are applied to the control grid of the 6B7. The d-c applied to this grid increases the bias as the a-f is increased and prevents overload as the volume control is advanced. By virtue of an effect of a high series resistance in the screen grid circuit, the cut-off of the operating characteristic is extended as the control grid bias is increased, thereby preventing distortion. After amplification by the 6B7, the audio signal is transmitted to the output stage and thence to the loudspeaker for final reproduction.

POWER

The heaters of all tubes are supplied directly from the battery of the car through efficient filters within the receiver housing. High voltage d-c plate and bias supply is obtained from the six-volt battery by use of a mechanical interrupter and a tube rectifier. The interrupter is adapted for convenient removability by having its base constructed for "plug-in" mounting.

GROUNDING

The wiring of the receiver chassis is so arranged that sensitive circuits are grounded at points predetermined by careful tests. This procedure reduces noise induction caused by interference

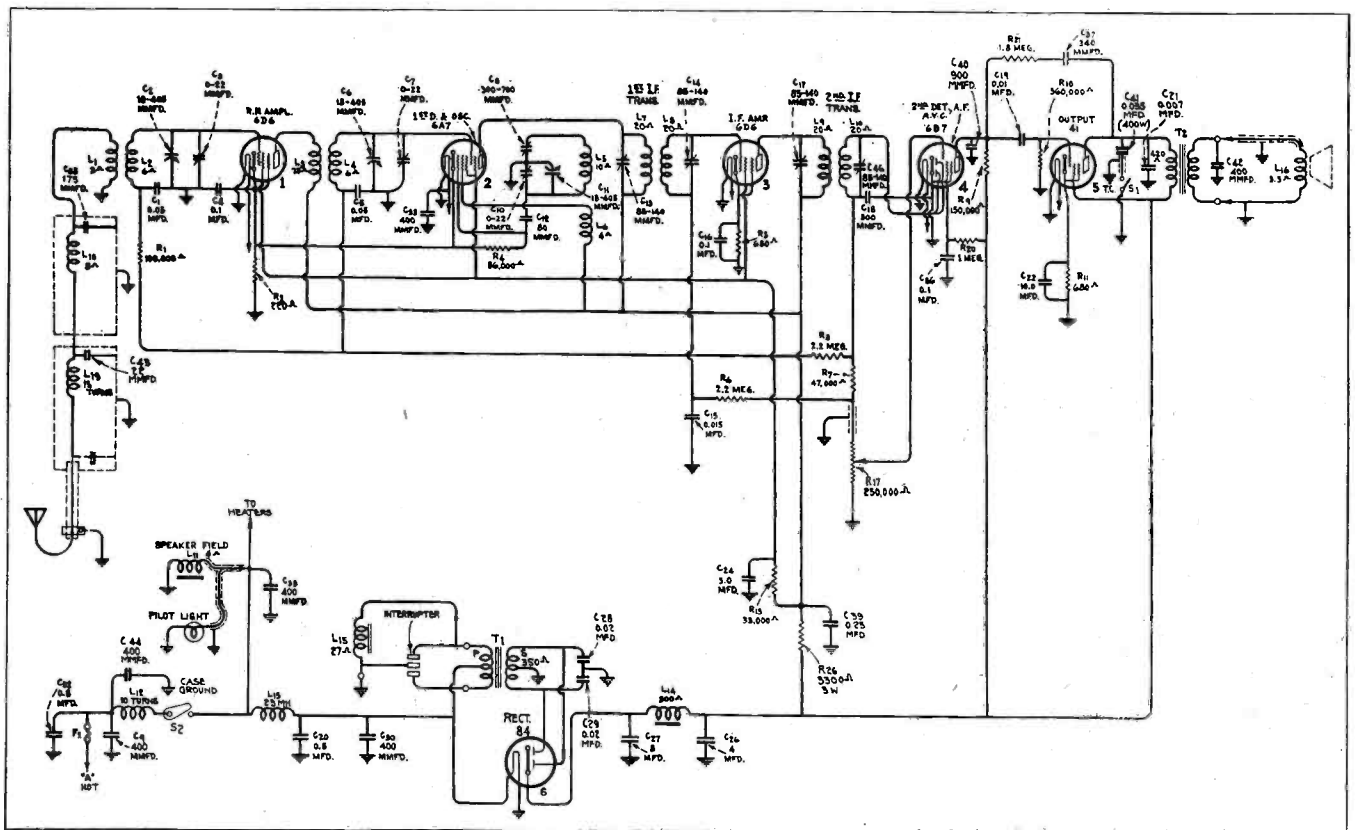
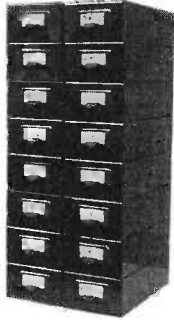


Fig. 1. Circuit of Hudson-RCA Victor H-6.

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TUBULAR Surgeproof and Openproof CONDENSERS. OIL PROCESSED!

Amt.	Cap. MFD	D. C. Volts Working	Type	Price List	Total
3	.001	600	M-1	@ .18	.54
2	.002	600	M-2	@ .18	.36
3	.005	600	M-5	@ .18	.54
5	.01	600	M-10	@ .18	.90
5	.02	600	M-20	@ .20	1.00
5	.05	400	M-50	@ .22	1.10
5	.10	400	410-T	@ .25	1.25
3	.25	400	425-T	@ .25	1.05
3	.50	400	450-T	@ .50	1.50

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circulating in the receiver case. Several of the circuits are grouped and grounded at a single point to further eliminate such trouble. The resistance of the chassis, the receiver housing and the shielded cable has been kept as low as possible in order to minimize ignition noise.

DEFECTS EXTERNAL TO RECEIVER

Interference—Failure or disconnection of spark suppressing capacitors at gas gauge, temperature indicator, and generator will allow the ignition interference produced at such points to be radiated and picked up by the receiver. Defects in the ignition system not only affect operation of the car but will produce radio interference as well. The system should therefore be thoroughly checked and repaired if necessary. The three pairs of bonding fingers attached to the floor boards which contact the transmission control cover, and the bonding strap from muffler front bracket to chassis frame side member for noise reduction, may develop loose connections and cause intermittent noise level in the receiver. In checking the receiver for noisy operation, it is also wise to make sure that interference is not being caused by disturbing electrical devices which are not part of but are in the vicinity of the car.

Battery—Corroded terminals at the storage battery will usually result in low voltage at the receiver and consequent low sensitivity. Noise may also be generated by this condition. Battery conditions will be reflected in the motor operation as well as that of the radio.

Antenna—Vibration may occasionally cause the antenna connections to become

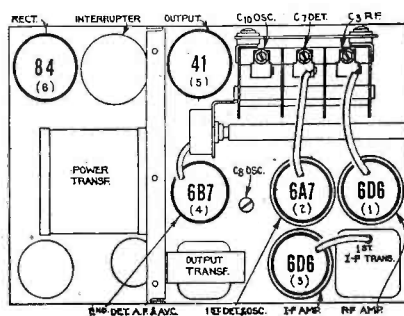


Fig. 3. Chassis layout for Hudson-RCA Victor H-6.

loose or broken. These should be carefully checked and repaired if necessary. Corrosion due to weather is also deleterious at these points. Each connection should be thoroughly cleaned to assure solid contact at all times. The grounding point of the antenna lead shield is at the front, left, running board bracket. This point of connection should not be changed, since its position on the car is very critical in regard to interference. The ground connection to the case of the receiver should be kept in secure connection to the frame of the car at all times; if loose, it may cause intermittent operation of the receiver, loss of sensitivity or will produce noisy reception.

ALIGNMENT PROCEDURE

There are a total of eight trimmer adjustments provided. Four of these are involved with the i-f system and the remainder are associated with the antenna, oscillator and first detector coils. They are precisely adjusted at the factory to give the correct performance.

In re-adjusting the trimmers to their normal settings, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator will be required as the source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. Two indication methods are applicable. One requires use of cathode-ray oscillograph equipment and the other requires a voltmeter or glow type of indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave image which represents the resonance characteristics of the circuits being tuned. This type of alignment is possible through use of apparatus such as described in conjunction with the data on the RCA Victor C15-3 in this issue.

ALIGNMENT

Place the receiver in operation with its two covers removed. Attach the output indicator across the loudspeaker voice coil circuit or across the output transformer primary. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each trimming operation, regulate the test oscillator output control so that the signal level is as low as possible and still observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from AVC action on a stronger one.

I-F ADJUSTMENTS

(a). Connect the output of the test oscillator between the control grid cap of the i-f tube (6D6) and chassis-ground. Adjust the frequency of the oscillator to 260 kc. Tune the receiver to a point where no interference is received from the heterodyne oscillator or local stations.

(b). Adjust the trimmers, C-46 and C-17 (see Fig. 2) of the second i-f transformer so that each produces maximum (peak) receiver output as shown by the indicating device.

(c). Remove the oscillator from the i-f tube input; connect it between the control grid cap of the first detector tube (6A7) and chassis-ground. Allow its tuning to remain at 260 kc. Tune the receiver to avoid interference as in (a).

(d). Adjust the trimmers, C-14 and C-13, of the first i-f transformer for maximum (peak) receiver output. The indication for this adjustment will be

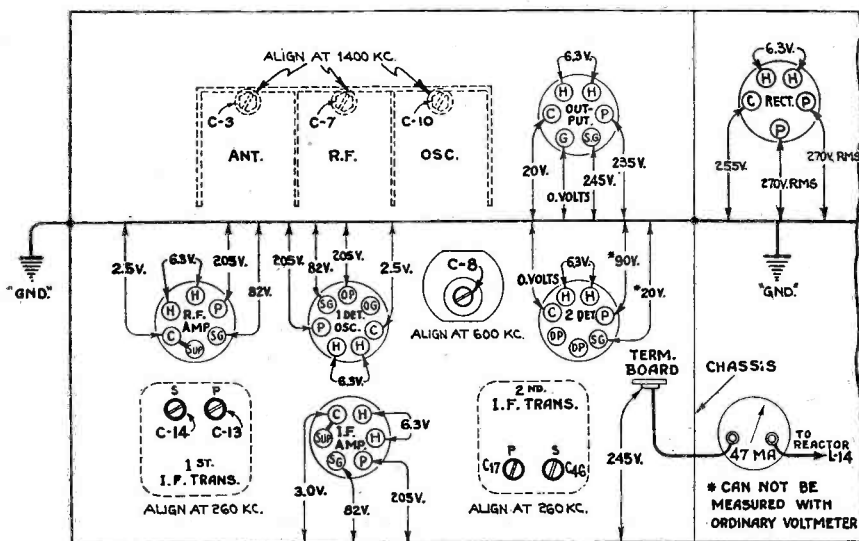


Fig. 2. Trimmer locations and voltage readings.

1936

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1936



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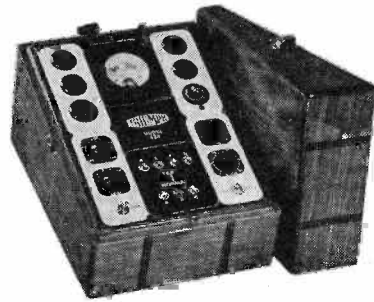


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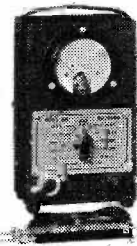
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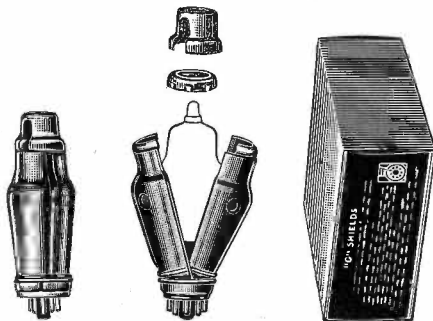
MODEL 300 MULTIRANGE METER. Reads audio output, A.C. and D.C. volts to 1000. D.C. Mils. Resistance $\frac{1}{2}$ ohm to 10 megs. 11 ranges—one switch. Separate Red and Black scales. **DEALERS' NET PRICE \$19.95.**



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They know that Arcturus "G" Tubes, built along experience-proved methods, will perform efficiently; that 'service call-backs' won't happen; that Arcturus "G" Tubes will do the job better!

They know that customer satisfaction is insured; they have no fear of losing a set sale or a customer when using "G" Tubes.

If you are interested in low cost of sales or service and bigger profits, better get the details of Arcturus "G" Tubes from your distributor. Arcturus Radio Tube Co., Newark, N. J.

ARCTURUS "G" TUBES

(GLASS COUNTERPART
OF ALL-METAL TUBES)

1. Characteristics identical to all-metal tubes.
2. Pin connections and base same as all-metal tubes.
3. Type numbers correspond to all-metal tubes (except our 5Y3 is a counterpart of the 5Z4).
4. Positively interchangeable with all-metal tubes.
5. Proved efficiency; built along conventional manufacturing practices; not an experiment.
6. Available now in quantities.
7. Currently used as initial equipment by several leading set manufacturers.

Characteristic Chart sent on request.

ARCTURUS RADIO TUBES

SAY YOU SAW IT IN SERVICE

509

broad due to the "flat-top" characteristic of the i-f system. The two trimmers, C-14 and C-13, should, therefore, be very carefully aligned so that the indicator remains fixed at maximum as the oscillator is shifted through a range 2 kc above and below its nominal setting of 260 kc. *An irregular double peaked indication is to be avoided.*

R-F ADJUSTMENTS

(a). Check the calibration of the dial scale of the remote control unit by rotating the tuning control until the variable condenser plates are in full mesh (maximum capacity). This will carry the dial pointer to its minimum frequency position. The knurled shaft at the rear of the control box should then be turned until the dial pointer sets exactly on the last graduation at the low-frequency end of the dial scale.

(b). Connect the output of the test oscillator to the antenna-ground terminals of the receiver with a 100-mmfd capacitor in series with the antenna lead. Tune the oscillator to 1400 kc. Allow the output indicator to remain attached to the receiver output.

(c). Tune the receiver so that the dial reading is 1400 kc. Then adjust the oscillator, detector and antenna coil trimmers, C-10, C-7 and C-3 respectively, tuning each to the point producing maximum indicated receiver output.

(d). Shift the oscillator frequency to 600 kc and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. The oscillator series trimmer, C-8, should then be adjusted, simultaneously rocking the receiver tuning control backward and forward through the signal until maximum (peak) receiver output results from the combined operations. The adjustment of C-10 should be repeated as in (c) to correct for any change in its alignment due to the adjustment of C-8.

CIRCUIT VOLTAGES

The voltages indicated at the socket contacts in Fig. 2 will serve to assist in analyzing defective circuit conditions. Each value as specified should hold within plus or minus 20% when the receiver is normally operative at rated supply voltage. They are actual operating values and do not take into account measurement inaccuracies which may be due to the loading effect of a voltmeter's internal resistance. For the majority of readings a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each check is chosen as high as possible, consistent with good readability. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance.

Wells-Gardner Series 6S

This is a 6-tube auto receiver having a frequency range of 530 to 1,650 kc. A 6-inch dynamic speaker is used and the audio power output is 3 watts maximum. The power consumption of the receiver is 5.75 amperes at 6 volts.

CIRCUIT

The circuit (Fig. 1) consists of a 6D6 r-f stage, a 6C6 1st detector-oscillator stage, a 6D6 i-f stage, a 75 dual diode-triode tube, which functions as a diode 2nd-detector and a triode 1st audio stage, and a single 41 output stage. An 84 full-wave rectifier is used in the power unit. The intermediate frequency is 175 kc. The diode current establishes a drop across a resistor which is used as additional bias voltage for the r-f and i-f tubes giving automatic volume control action. The

manual volume control varies the audio voltage to the grid of the 75 tube.

ALIGNMENT PROCEDURE

Misalignment or mistracking of condensers generally manifests itself as broad tuning and lack of volume at portions or all of the standard wave band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the Service Man has the proper equipment.

A signal generator that will provide accurately calibrated signals over the standard wave band and at the intermediate frequency, and an output meter are required for indicating the effect of adjustments.

Use a non-metallic screwdriver for the adjustments. The complete procedure is as follows:

I-F ADJUSTMENT

Remove chassis from case.

Establish ground connection between chassis and power supply.

Reconnect A and B wires from power supply to chassis.

Set the signal generator for a signal of 175 kc.

Connect the antenna lead of the signal generator through a .05-mfd. condenser to the stator of the 1st detector (middle) section of the tuning condenser. This can be done by pushing a wire or conductor between the stator plates or by extending an insulated wire through the hole in the shield over the stator and pushing the wire through the hole in the lug which extends up from the insulated stator assembly.

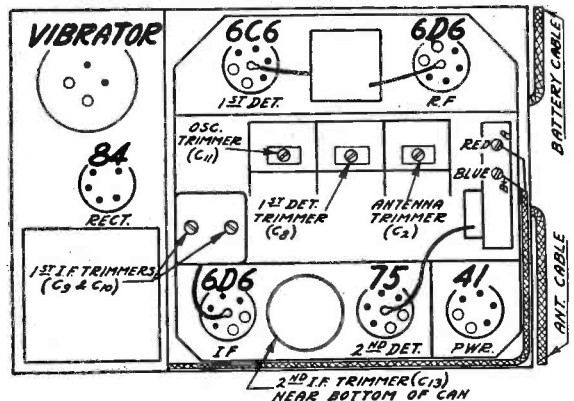
Connect the ground lead of the signal generator to the chassis ground.

Short out the oscillator section of the tuning condenser.

Voltages at Sockets Antenna Disconnected - Voltage at Battery 6.1						
Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cath. to Ground	Normal Plate M.A.
6D6	R. F.	5.8	218	100	5.2	5.8
6C6	1st Det. and Osc.	5.8	218	100		2.0
6D6	I. F.	5.8	218	100	5.2	5.8
75	2nd Det. & 1st A. F.	5.8	160 (1)		1.4	2.8
41	Output	5.8		220	16.0	16.0
84	Rectifier	5.8				20.0 per plate
Speaker Field		.1.15 Amperes		"B" Unit		3.00 Amperes
Chassis		1.50 Amperes		Pilot Lamp		0.1 Amperes

(1) Measured on 1000 V. Scale (1000 Ohms per volt)

Figs. 2-3. Voltage table and chassis layout for Wells-Gardner 6S





"QUIET" . . . is the insistent demand of millions who today own all-wave receiving sets. Give them what they want, by installing

NOISE-MASTER

• ALL-WAVE ANTENNA •

This remarkable unit, A.A.K. patented and engineered with traditional CORWICO thoroughness, is building sales and good will for dealers and service organizations everywhere. It is actually AUTOMATIC electrically, requiring no adjustment or manual operation after it has been installed by a qualified Service Man.

FOR EVERY SET AND LOCATION

"NOISE-MASTER" picks up and clarifies feeble overseas signals, straining out the "man made" static that sometimes seems to make radio a curse instead of a blessing. Minimizing the noises caused by household appliances near the set, "NOISE-MASTER" improves broadcast as well as shortwave reception. It successfully operates more than one set from a single aerial. We guarantee that "NOISE-MASTER" will eliminate noise when properly installed, and urge you to recommend it at every opportunity.

List Price **\$6.75**

Also supplied with special transformers for European broadcast bands. List Price . . \$7.00

Send for latest complete literature describing this and other up-to-the-minute antenna units.



CORNISH WIRE CO., Inc.
30 Church Street
New York City

WARD LEONARD

Replacement Resistors for Servicemen

Ward Leonard resistors are known throughout the radio industry for their accuracy and dependability. All Ward Leonard resistors are made with a high grade resistance wire, wound on a special refractory tube and are conservatively rated.



VITROHM

Resis. Ohms	Catalog Number	Cur. m. a.	Price
1	507-598	3880	\$0.40
3	507-599	2240	.40
5	507-390	1740	.40
10	507-391	1225	.40
15	507-392	1000	.40
25	507-393	775	.40
50	507-394	550	.40
75	507-395	450	.40
100	507-331	390	.40
150	507-396	315	.40
200	507-397	275	.40
250	507-332	245	.40
400	507-333	195	.40
500	507-334	175	.40
750	507-335	140	.40
800	507-409	135	.40
1,000	507-336	125	.40
1,250	507-410	110	.40
1,500	507-337	100	.40
2,000	507-338	85	.40
2,500	507-339	75	.40
3,000	507-340	70	.40
4,000	507-398	60	.40
5,000	507-341	55	.40
7,500	507-411	45	.40
10,000	507-412	40	.40
12,500*	507-207	20	.40
15,000*	507-208	18	.40
20,000*	507-209	16	.40
25,000*	507-210	14	.40
30,000*	507-211	13	.50
35,000*	507-212	12	.50
40,000*	507-213	11	.60
45,000*	507-408	10.5	.60
50,000*	507-214	10	.60

No Brackets furnished.

*Low temperature. Black finish. Rated at 5 watts.

10 WATTS—1 1/8" x 9/16"

60,000†	507-399	10	\$1.00
70,000†	507-400	8.5	1.00
75,000†	507-401	8	1.00
80,000†	507-402	7.5	1.00
90,000†	507-403	6.5	1.00
100,000†	507-404	6	1.00

†Furnished with combined tab and lead terminal. Black Finish. No Brackets furnished.



VITROHM

Resis. Ohms	Catalog Number	Cur. m. a.	Price
1	507-413	4480	\$0.65
3	507-414	2570	.65
5	507-415	2000	.65
10	507-416	1410	.65
15	507-417	1150	.65
25	507-418	900	.65
50	507-419	630	.65
75	507-420	510	.65
100	507-421	450	.65
150	507-422	365	.65
200	507-423	320	.65
250	507-424	285	.65
400	507-425	220	.65
500	507-426	200	.65
750	507-427	160	.65
800	507-428	155	.65
1,000	507-429	140	.65
1,250	507-430	125	.65
1,500	507-431	110	.65
2,000	507-432	100	.65
2,500	507-433	90	.65
3,000	507-434	80	.65
4,000	507-435	70	.65
5,000	507-436	65	.65
6,000	507-437	55	.65
7,500	507-438	50	.65
10,000	507-439	45	.65
12,500	507-440	40	.65
15,000	507-441	36	.65
25,000*	507-442	17	.75
35,000*	507-443	14	.75
40,000*	507-444	13	.75
50,000*	507-445	12	.75
60,000*	507-446	10	1.00
70,000*	507-447	8	1.00
75,000*	507-448	7	1.00

*Low temperature. Black finish. Rated at 7 watts.

No Brackets furnished.



Send for Complete Price List No. 507A

WARD LEONARD

RESISTORS FOR SERVICEMEN

WARD LEONARD ELECTRIC COMPANY

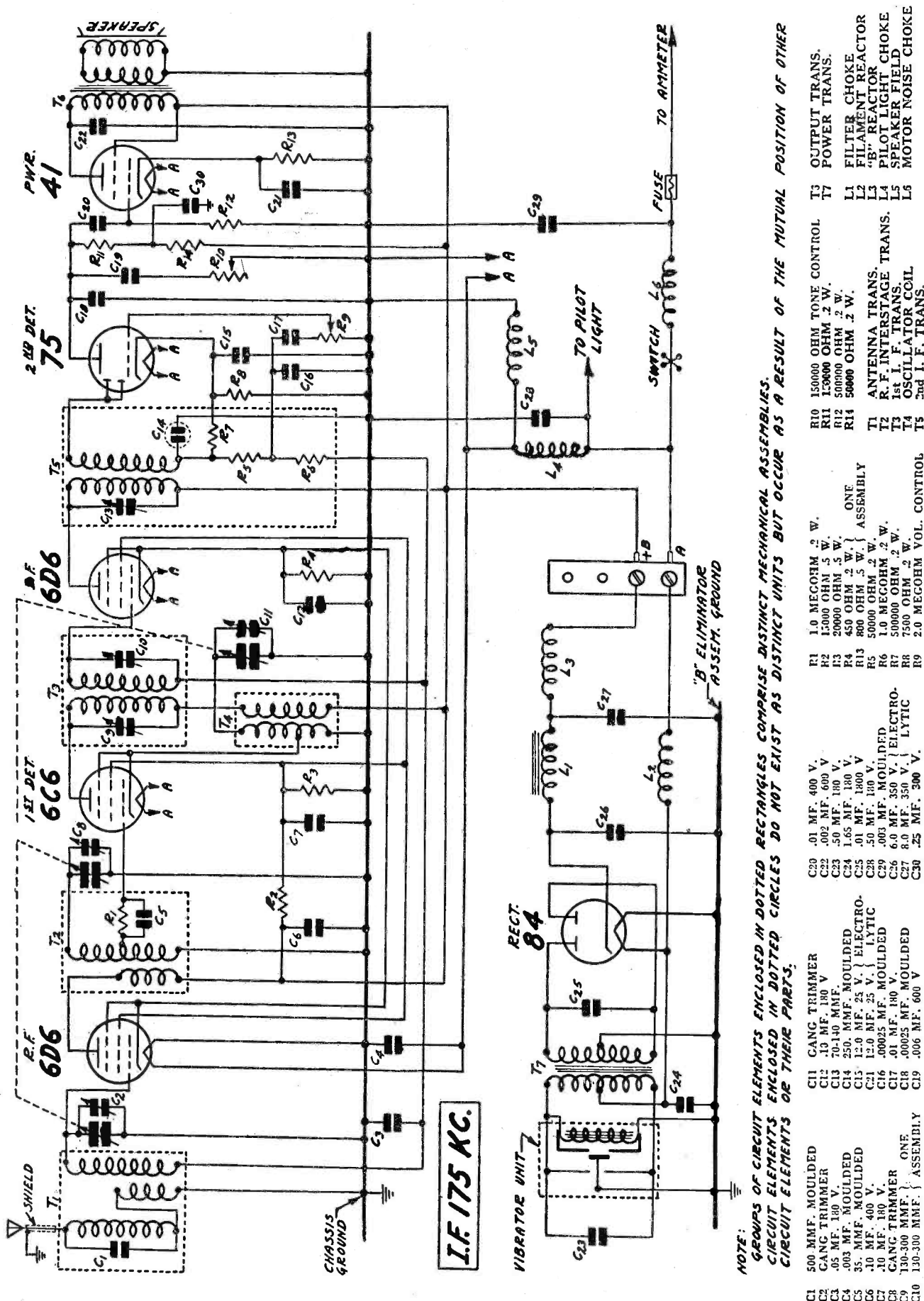
South Street, Mount Vernon, N. Y.

Please send me Bulletin 507A.

Name

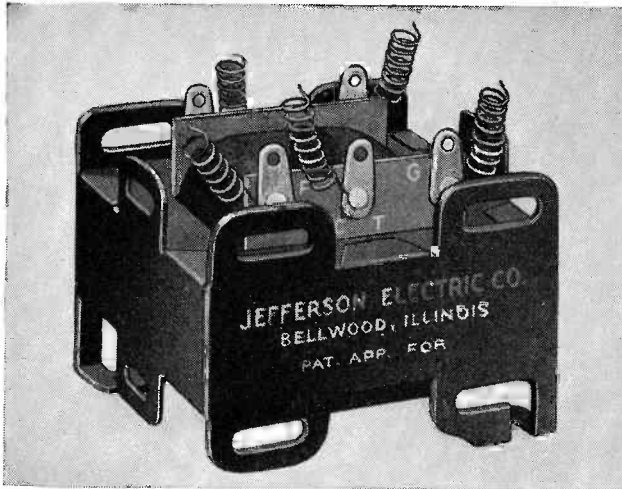
Street

City State.....



- NOTE:**
 GROUPS OF CIRCUIT ELEMENTS ENCLOSED IN DOTTED RECTANGLES COMPRISE DISTINCT MECHANICAL ASSEMBLIES.
 CIRCUIT ELEMENTS ENCLOSED IN DOTTED CIRCLES DO NOT EXIST AS DISTINCT UNITS BUT OCCUR AS A RESULT OF THE MUTUAL POSITION OF OTHER
 CIRCUIT ELEMENTS OR THEIR PARTS.
- | | | | | | |
|-----|-------------------------|-----|----------------------------|-----|-------------------------|
| C1 | 500 MMF. MOULDED | C11 | GANG TRIMMER | R10 | 150000 OHM TONE CONTROL |
| C2 | GANG TRIMMER | C12 | .10 MF. 180 V. | R11 | 150000 OHM 2 W. |
| C3 | .05 MF. 180 V. | C13 | 70-140 MMF. | R12 | 500000 OHM 2 W. |
| C4 | .003 MF. MOULDED | C14 | 250 MMF. MOULDED | R13 | 50000 OHM 2 W. |
| C5 | 35 MMF. MOULDED | C15 | 12.0 MF. 25 V. } ELECTRO. | R14 | 50000 OHM 2 W. |
| C6 | .10 MF. 400 V. | C16 | 12.0 MF. 25 V. } LYTIC | T1 | ANTENNA TRANS. |
| C7 | .10 MF. 180 V. | C17 | .00025 MF. MOULDED | T2 | R.F. INTERSTAGE TRANS. |
| C8 | GANG TRIMMER ONE | C18 | .01 MF. 180 V. | T3 | 1st I. F. TRANS. |
| C9 | 130-300 MMF. } ASSEMBLY | C19 | .00025 MF. MOULDED | T4 | OSCILLATOR COIL |
| C10 | 130-300 MMF. } ASSEMBLY | C20 | .01 MF. 400 V. | T5 | 2nd I. F. TRANS. |
| | | C21 | .002 MF. 350 V. } ELECTRO. | T6 | 150000 OHM TONE CONTROL |
| | | C22 | 8.0 MF. 350 V. } LYTIC | T7 | OUTPUT TRANS. |
| | | C23 | .50 MF. 180 V. | L1 | FILTER CHOKES |
| | | C24 | 1.65 MF. 180 V. | L2 | FILAMENT REACTOR |
| | | C25 | .01 MF. 1800 V. | L3 | .4B" REACTOR CHOKE |
| | | C26 | .50 MF. 180 V. | L4 | PILOT LIGHT CHOKE |
| | | C27 | .003 MF. MOULDED | L5 | SPEAKER FIELD |
| | | C28 | 1.0 MEGOHM 2 W. | | MOTOR NOISE CHOKE |
| | | C29 | 1.0 MEGOHM 2 W. | | |
| | | C30 | 25 MF. 300 V. | | |

Fig. 1. Complete schematic diagram, with parts values, for the Wells-Gardner 6S



Universal Input Transformer No. 467-168. Has silvered lugs and leads, vacuum-treated windings, and is adaptable to all types of receivers. Compact—low cost. Also can be used as audio by omitting center tap.

For True PROFIT Replace with Jefferson

TRUE profits on replacement parts and repair work are not what you take in, but what you keep. In other words, every part must satisfy—there must be no return service calls, without charge, to eat up your profit.

The safe way to make profits you can keep is to sell only parts as good or better than were used originally in the set. Ever since the birth of radio, leading manufacturers have used Jefferson Transformers year after year.

Protect yourself by selling replacement parts of recognized quality. Established wholesalers can supply you from stock. Be sure to ask your wholesaler for the latest Jefferson Catalog and Amplifier Circuits. You can build commercial type amplifiers profitably with Jefferson Foundation Kits. If your wholesaler is not yet able to supply you with Jefferson products and literature write us mentioning his name.

JEFFERSON ELECTRIC COMPANY
Bellwood (Suburb of Chicago) Illinois
Canadian Factory: 535 College Street, Toronto

JEFFERSON *Radio* Transformers

New! **MUTER**
Interference Filters



This "Traffic Cop" of Radio absolutely eliminates the man-made interference that comes in over the power line by merely attaching the Filter directly to the set itself.

Sell these filters with confidence and **GUARANTEE** their operation, because *they will do the job*. There's a real need for them.

Ask your jobber or take advantage of our trial offer.

MAIL THE COUPON!

THE MUTER COMPANY

Dept. D-11

1255 South Michigan Avenue
Chicago, Illinois



Please ship me one Muter Interference Filter at your trial offer of \$1.80 (\$3.00 list, less 40%).

- I am enclosing \$1.80
 Ship it C.O.D. for \$1.80

Name

Address

City State

AUTO-RADIO—continued

Set the volume control at the maximum position.

Attenuate the signal from the signal generator to prevent the leveling off action of the avc.

Then adjust the three i-f trimmers until maximum output is obtained. The location of these trimmers are shown in Fig. 2.

1650-KC ADJUSTMENT

Set the signal generator for 1650 kc. Turn the rotor of the tuning condenser to the full open position.

Connect the shielded antenna lead from the chassis through a 250-mmf. condenser to the antenna post of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent avc action.

Adjust the trimmer of the oscillator section of the three-gang condenser until maximum output is obtained—see Fig. 2 for location of this trimmer.

1400-KC ADJUSTMENT

Set the signal generator for 1400 kc. Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the 1st detector and antenna trimmers for maximum output.

Do not change the setting of the oscillator trimmer.

ADJUSTING ANTENNA TRIMMER

After the receiver is installed and the car antenna is connected it will be necessary to adjust the antenna trimmer. Tune in a weak signal between 1200 and 1400 kc with the volume control about three-fourths on. Remove the cover of the chassis case. The antenna trimmer is the trimmer condenser closest to the terminal strip—see Fig. 2. Turn the adjusting screw of this condenser up or down until maximum output is obtained. *Caution*—Do not turn any of the other trimmer adjusting screws for this adjustment.

CALIBRATING THE RECEIVER

After installing the receiver in the car, it will be necessary to calibrate the control unit. Tune in a station of known frequency at about the center of the dial. At the back of the control unit is a calibration screw—See Fig. 4 in the installation manual enclosed with each receiver. Remove the pilot light assembly.

The calibration screw will be seen at the bottom of the receptacle from which

the pilot light assembly is withdrawn. Insert a screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received. *The knob must be held during this adjustment.*

VOLTAGES AT SOCKETS

On the voltage chart of Fig. 3 are given the voltages at the sockets with all tubes in and the set in operating condition. The antenna should be disconnected.

The voltages can be read with the chassis in the case, by means of an analyzer plug.

If the chassis unit is taken out of the case all of the socket terminals can easily be reached under the chassis with test prods.

If the chassis is taken out, a jumper wire must be connected from the chassis base to the metal wall of the "B" power unit, in order to complete the ground circuit.

Auto-Radio Switches

The switches in auto-radio receivers are often a source of trouble, and frequent replacements are necessary. After being in operation for a period of time a considerable drop in volume may often be noticed in the receiver. This can frequently be traced to sparking at the switch contact points, which, after a length of time, causes a higher resistance to exist at the contact points. The result is an additional voltage drop which, though it may be small, will often be sufficient to reduce the volume a noticeable amount.

In replacing switches it is well to use units having silver-plated contacts

along with a suitable condenser, the latter to reduce the arcing. The rating of such a condenser will, of course, depend upon the particular radio receiver as well as the type of storage battery.

The accompany illustration shows a series of self-explanatory switch circuits which the writer has found to be effective in reducing arcing to a minimum. Such installations have been found to last almost indefinitely.

George F. Baptiste

Reversing Elimnode Connection in GM 79 and 110

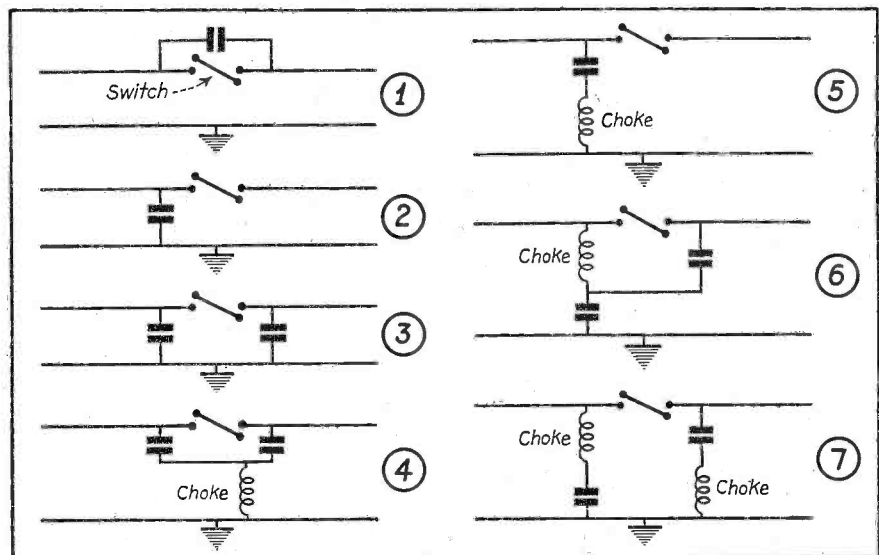
When installing GM No. 79 and No. 110 sets on a *roof aerial*, it is also necessary to reverse the two connections to the *movable coil* of the Magic Elimnode. This coil may be reached by removing the rear cover of the set. This change is also necessary, but in reverse order, when installing the standard No. 75 or No. 100, using an under-car aerial.

Installations in Old Cars

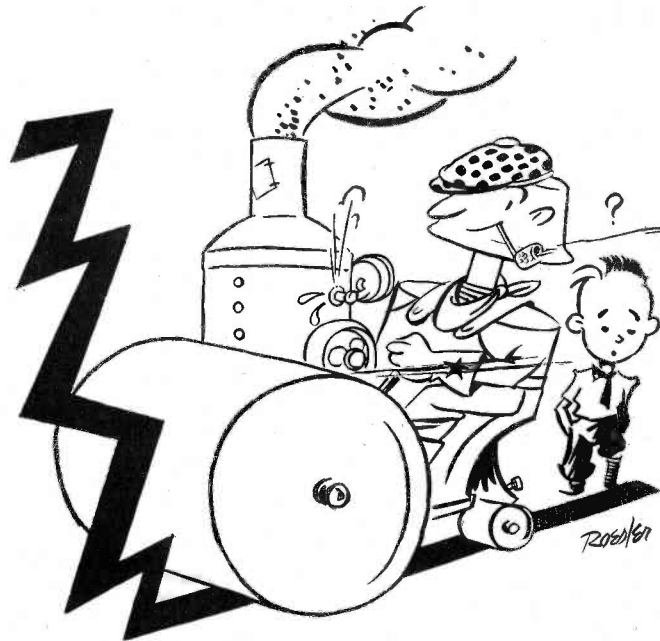
Whenever we get an installation in an old car not equipped with an antenna, we use the Motorola Models 110, 79 and 62, cutting an opening on the dash for the head and using a Chevrolet or Pontiac medallion which makes a very neat and well-balanced job. We also clean a spot on the frame of the car with an electric brush and fasten the antenna shield directly to the frame of the car. We have found by fastening the shielding directly to the frame and using the customary condensers we have no motor noise, regardless of the age of the car.

MAURICE MASTROFF.

Courtesy Motorola



Various power-switch circuits for auto-radio receivers.

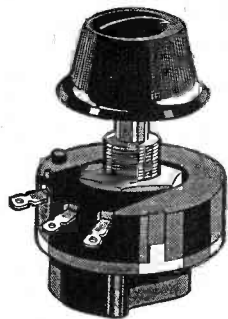


"Smooth job - eh?"

Old Man CENTRALAB is at the wheel my fraand! Arch-enemy of noise . . . as smooth as an ambassador . . . he takes those noisy "sets" and presto: the customer pays with a smile.

Thousands (yes thousands) of servicemen everywhere carry a small stock of CENTRALAB at all times . . . and they can service practically every job . . . better than ever before.

Centralab smoothness results from the patented Centralab non-rubbing contact whereby a strip of polished metal rocks on the resistor so that the only rubbing action is between an oilless wood bearing and the polished metal.



Every Radio Service Man should be a member of the Institute of Radio Service Men

Centralab

MILWAUKEE, WIS.

**RADIOHMS SUPPRESSORS
FIXED RESISTORS**

All-Wave Sets

need



this **ALL-WAVE ANTENNA**
 Increase Your Profits
 with **BROWNIE**
ALL-WAVE ANTENNAE

THE surest way to extra profits this fall is to push the Brownie All-Wave Antenna. As a smart dealer, you know that a tremendous market exists for this high grade antenna. Most owners of short wave radios are not getting satisfactory reception. This is largely due to the use of a cheap or inefficient antenna. Now, with the Brownie you can sell a better antenna and make a real profit besides.

Customers Stay Sold

Sell a dissatisfied customer a Brownie and the Brownie will re-sell the set. Repeated tests have proved that the Brownie will out-perform most antennae on the market today—none surpass it either in results or in quality of design and workmanship. For distance and volume, for clarity and freedom from man-made interference the Brownie is in a class by itself.

The Brownie is constructed on the Balanced Doublet System and uses a new type, super efficient matching transformer. Complete with all necessary parts, the Brownie is easily and quickly installed. And back of every antenna is the experience and fine reputation of a long established manufacturer in the electrical field.

Be in a position to cash in on the national advertising campaign, starting soon in Colliers and the Saturday Evening Post. Remember, when you sell a Brownie you are not only making a handsome profit, but you are "sewing up" a customer for life. Just mail the coupon for our money making proposition.

PORCELAIN PRODUCTS, INC., FINDLAY, OHIO

Mail this Coupon Today

Porcelain Products, Inc. Dept. B Findlay, Ohio
 If there's real merit to your antenna, I'm interested. If there's a real profit for me, I want to make it. Rush me your proposition

Name _____
 City _____ State _____
 My Jobber is _____

ON THE JOB . . .

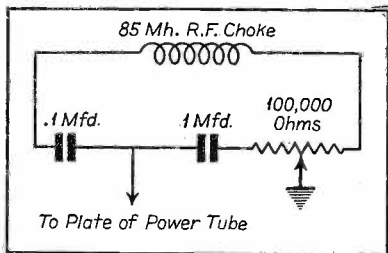
Regeneration in Analyzer Cables

I have often seen Service Men spend hours hunting for troubles that did not exist, simply because regeneration in the long paralleled leads of the analyzer cable had led them to the conclusion that certain currents were abnormal in value. When measuring milliamperes in r-f circuits open the circuit with a small capacity adapter or with a soldering iron. Better yet, use a resistance analysis.

Jim Kirk

Improving Quality in Midgets

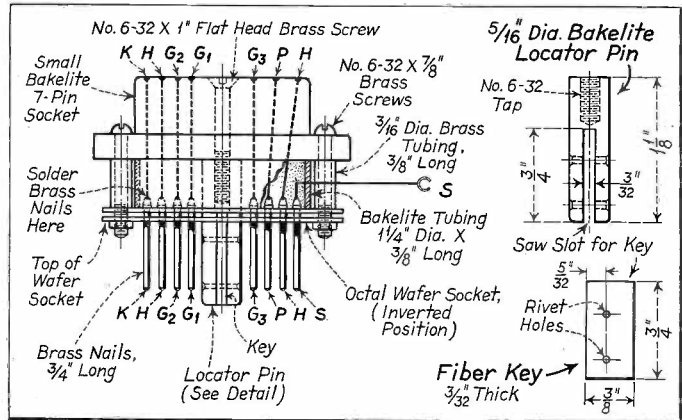
There are many varieties of midget radios on the market. Some of these



A circuit for improving the tone quality of midget sets.

sets have fair tone quality, but most of them are far from good in this respect. I have found that the tone quality can be greatly improved by using the self-

An adapter for the standard 7-prong analyzer plug to octal tube base.



explanatory arrangement shown in the accompanying illustration.

F. U. Dillon

Servicing Records

I have found it convenient to keep a record of hints, diagrams, and interesting topics, after the fashion shown in the accompanying illustrations. On one side of all diagrams, the issue and year; on the back side of the same sheet is a record of all the hints. I also keep a separate record of automobile-radio data.

For interesting topics I use cards (purchased from the 5 and 10) similar to the one illustrated.

I have found these records a great help in servicing.

William R. Jex

Adapter—7-Prong Plug to Octal Tube Socket

One way of "rolling" an adapter for the standard 7-prong analyzer plug to octal tube base is shown in the accompanying illustration. The material used is also included in the illustration.

The 1/4 inch bakelite tubing may be sawed from an old 4- or 5-pin tube base. The locator pin is a 5/16 inch bakelite rod 1 1/8 inch long. Saw a slot down the middle of this rod 3/4 inch deep, and then drill and tap a hole for a 6-32 screw 5/16 inch deep. Cut a piece of 3/32 inch fibre 3/8 inch wide and 3/4 inch long for the key, and fit in slot of locator pin. Then drill two small holes and rivet as shown. Now with a small file trim for a nice fit in keyway of octal socket.

Procure some brass nails slightly larger than No. 12 bus wire and cut them to a length of 3/4 inch. Push these nails in pinholes of octal socket and solder. Connect leads to octal socket, drill clearance holes through middle of small 7-pin socket for 6-32 screw, put leads through 1/4 inch bakelite tubing and then solder to respective connections on small 7-pin socket. Now screw 6-32 by 1 inch flat-head screw into locator pin. Then fasten the two 6-32 by 7/8 inch screws through 1/8 by 3/8 inch brass tubing, bolting entire unit together.

Put a grid clip on shield contact of octal socket (this connects to spare stud on plug). Run another wire up analyzer cable with banana plug on end. Banana plug goes in either -V or -test lead jack on analyzer panel (bring chassis up to panel for any type of socket-to-chassis tests on octal tubes). This eliminates the extra lead from analyzer to chassis.

Al. Beers

(Right) Card used for keeping a record of interesting notes.

(Below) A record of diagrams and servicing notes. See accompanying text.

SPEAKER - DUAL INSTALLATION.....	SERVICE	OCT. 32	Filed under S
AUTOMATIC VOLUME CONTROL { QAVC DELAYED	"	Nov. 32	" A
VOICE COIL PHASING.....	"	OCT. 32	" V
BIAS CONTROL - AUTOMATIC.....	"	DEC. 33	" B
MICROPHONE - VELOCITY.....	"	NOV. 34	" M
{ TUBE CHARACTERISTICS.....	"	NOV. 34	" T
METAL TUBES.....	"	JULY, 35	" T
TUBES AND THEIR APPLICATIONS.....	"	JULY, 35	" T

Front of Page					Back of Page	
YEAR	1932	1933	1934	1935 etc.	SERVICE PHILCO	SERVICE PHILCO
JAN.						JAN. '35 Brackling Model 112
FEB.		37 BATTERY	84			JAN. '35 Moisture in Philco Models
MAR.		53				MAR. '35 I. F. Beaks
APR.		48 D.C.				MAR. '35 Howl - 54C
MAY						JUNE '35 No Reception - 111 - 111A
JUNE	15					AUG. '35 Circuit Change - 16 (code 125-6-7)
JULY	91	57A.C.		610		SEPT. '35 Oscillator - 65
AUG.			19	97		
SEPT.		17				
OCT.	80	38A	200			
NOV.		60-38	34-34A			
DEC.		44	29			

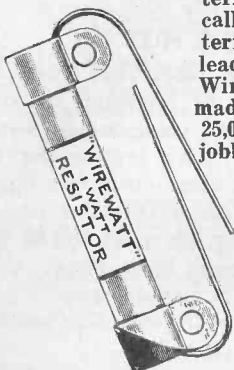


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1 Watt Wire-Wound Resistor
Hurdles Trouble!

WHY take a chance with composition units? WIREWATTS are absolutely noiseless. Changes in voltage or temperature do not affect them—resistance values remain constant. WIREWATTS are permanently trouble-free!

Wirewatts are the same size as composition units, and therefore useable in nearly all radio circuits. They are wound over a porcelain core, and covered with special insulating material. Resistance wire is mechanically locked and then brazed to terminal lugs. The 1½-inch tinned lead wires make for easy installation. Wirewatts are rated at one watt, and made in values from 100 through 25,000 ohms. Get them from your jobber or write for Catalog 14.



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ALL-METAL TUBES PRESENT NEW SERVICE PROBLEMS

Headquarters for Tube
Information Now Available
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Special to Service Engineers

NEW YORK, N. Y.—The almost overnight growth in popularity of all-metal tubes has made the service man an indispensable factor in the maintenance of radio reception.

The service man in turn must depend upon test instruments and service equipment as never before. The Radio Technician turns to a different manufacturer for each make of set, in order to secure schematic diagrams and service hints; but when it comes to problems involving the function of tubes in the radio circuit (no matter what standard type) he may submit his questions to the HEADQUARTERS for Tube Information.

Raytheon recognizes the radio service man's importance and is making every effort to cooperate: If you need up-to-date test instruments and efficient servicing equipment send for the Raytheon Broadside. It explains in detail how you can get them in tube deals. It's free!

The 8th Edition Tube Chart including characteristics of "G" type and all-metal tubes is just off the press. A postal card will bring it to you.

Tube Talks (including Tube Complements with over 2,000 standard models) a big loose-leaf book is available at 50¢* (*this includes free service supplements to be issued periodically.)

Finally if you have any tube problems or questions write to the nearest address below.

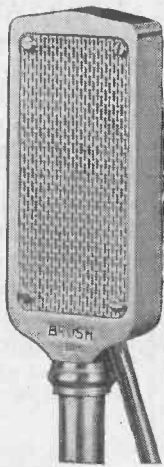
HEADQUARTERS FOR TUBE INFORMATION

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RECEIVER CASE HISTORIES

Colonial 250, 300

No avc: Caused by open or changed-value resistor (R-4, R-5, R-6) in circuit of 6B7 i-f, avc tube.

George F. Baptiste

Majestic 15

Receiver dead: Caused by burned-out antenna coil. In replacing also use an antenna coupling condenser. Check power-supply primary buffer condenser (0.01 mfd) for short or open. If this latter condenser is replaced use a unit with a higher voltage rating.

George F. Baptiste

Majestic 130-A

R-F oscillation: This oscillation may be over all or just the low-frequency part of dial. Remove spring contacts on variable-condenser rotors and solder pigtailed on each of the five rotor sections. Use phosphor-bronze dial cable insulated, where necessary, with spaghetti. Easiest to solder this to rotor casting with aluminum solder but use a very hot iron. If this does not stop oscillation, insert a 250,000-ohm, 1-watt resistor in series with first r-f screen grid. Do not bypass this point to chassis.

E. M. Prentke

Model 100 Motorola

Eliminating Hum or Filament Ripple: Occasionally a Model 100 Motorola will be encountered in which the filament ripple is excessive. This condition may be due to

(1) Excessively long "A" leads or high resistance joints in the hot "A" or ground circuits of the set.

(2) Improperly matched L.A. power output tubes.

(3) Excessive spacing of the vibrator reeds.

(4) Ripple occurring in the grid circuit of the 85 tube due to chassis currents.

Each one of the above conditions should be checked individually and isolated from the other, as excessive ripple may be due to a combination of all of them, and reduction of each one individually may be necessary.

Number 1 may be checked by securing a perfect ground on the radio set mounting bolts and connecting the "A" supply lead directly to the starter switch.

Number 2 may be checked by properly matching a pair of output tubes on a tube checker.

Number 3 may be checked by replacement with another vibrator.

Number 4 may be checked by short-circuiting the grid of the 85 tube to ground with a screw driver.

If when checking No. 4, the ripple is materially reduced, a simple wiring change may be made in this circuit. Proceed as follows:

With the set chassis placed on the bench so that you are facing the 4 tubes and output transformer assembly, remove the 37 tube and 85 tube from their respective sockets.

Locate the black lead extending from the ground lug of the manual volume control to the ground lug of the small 4-contact dummy lug strip located at the top of the r-f tube shield.

Next locate the black lead extending from this same lug on the 4-contact dummy lug strip down to the cathode of the 85 tube socket.

Clip this lead at both ends and remove it from the set completely.

Disconnect the volume control ground lead from terminal No. 2 of the 4-contact dummy lug strip and re-ground this to the i-f coil can (the face directly behind the 85 tube) and at a point approximately $1\frac{1}{4}$ inches above the set chassis.

Philco 800

Inoperative: Caused by vibrator points sticking. Do not attempt to file vibrator points, but replace with new unit. Also check buffer condenser for open or short as this condition will cause arcing at vibrator points. In order to test this condenser it is necessary to unsolder one lead in the primary circuit of the power transformer. Also, the receiver may be out of adjustment due to improper alignment of oscillator circuit. In this case, realign i-f amplifier and then adjust both the high- and low-frequency padders. Adjust at 1,500 and 600 kc.

George F. Baptiste

RCA R-35, R-39, RE-57

Noise: The writer has repeatedly experienced the following difficulties and recommends replacement of all resistors noted whenever one of these models is overhauled:

(1) No plate voltage on first audio tube—Replace R-14, 70,000-ohm 2-watt resistor in power supply.

(2) No plate voltage on detector tube—Replace R-8, 500,000-ohm 1-watt re-

sistor located next to r-f choke on resistor panel of r-f chassis.

(3) No screen voltage on detector tube—Replace R-5, 1.5-megohm 1-watt resistor located near R-8.

It is well to replace R-12 and R-13, 8,000-ohm 1-watt resistors, when servicing these sets.

E. M. Prentke

RCA R-37-P, R-38-P

Motorboating: Replace screen-grid condenser (C-14 in diagram) with 10-mfd electrolytic unit.

E. M. Prentke

RCA 50, 55; G.E. H-32

Intermittent or inoperative: Replace 0.1-mfd section of condenser in power unit (blue wire) connected to 1-megohm resistor. Also replace the 0.5-mfd section of same condenser (green wire) leading to 40,000-ohm resistor. If these models are intermittent with avc tube removed from socket, check i-f primaries for partial opens.

E. M. Prentke

Silvertone Models 1905, 1915, 1955, 1965

Selectivity Control Tension Washer: There is a "U" shaped tension washer which fits into a groove at the back end of the variable selectivity control shaft. This washer must be placed on the shaft so that the convex side of the washer faces the back end of the shaft. If the washer is put on wrong, with the concave side facing the back of the shaft, the washer will work itself off the shaft and the shaft then will become loose and can be pulled off.

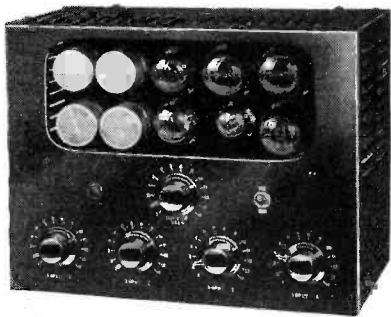
Silvertone Models 1918, 1968

Sensitivity Switch: Occasionally, a set is encountered in which the Sensitivity Switch turns when the "On-Off" switch knob is turned. This is due to a burr in the hollow shaft of the Sensitivity Switch, causing a tight fit of the hollow shaft on the "On-Off" switch shaft. Remove the Sensitivity Switch hollow shaft and clear away the burr with a piece of emery paper or with a round file. This hollow shaft must turn freely on the "On-Off" switch shaft.

Silvertone All-Wave (83 Rectifier)

Noise: Replace mercury rectifier with a 5Z3 tube.

E. M. Prentke



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A 4-Position 17-Watt Amplifier

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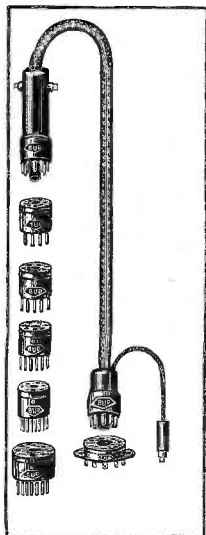
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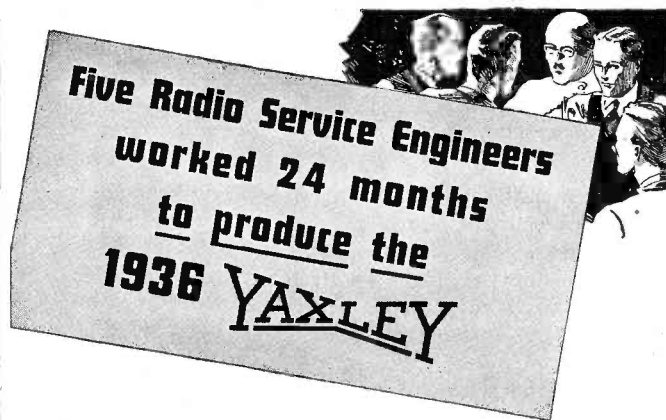
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Gentlemen: Please send me — absolutely free — a copy of the 1936 Yaxley Replacement Volume Control Manual.

Name _____

Address _____

My Jobber's Name is _____

Silvertone General Notes

All Models Using Dual Ratio Drive: There is a "U" shaped tension washer at the back end of the dual ratio drive shaft. This washer must be placed in the groove of the shaft so that the convex side of the washer faces the back end of the shaft. Any trouble from the washers working off the shaft, can be overcome by putting a drop of solder across the open end of the slot in the washer.

Any trouble with dual ratio drive operation caused by the escutcheon keeping the tuning knob in its "out" position, can be corrected as follows:

Remove the escutcheon. If there is a gasket behind the escutcheon, discard it. Bend the corners of the escutcheon out slightly so that when the escutcheon is replaced and its screws tightened, it will fit tightly against the cabinet.

All Models Using Variable Selectivity: Stiff action of the variable selectivity control can be corrected by putting a drop of Oildag or similar liquid graphite lubricant on the variable selectivity control cam. Less often Oildag on the flexible cables is necessary.

All Models With Aeroplane Type Dials: To set the dial pointer properly, fully mesh the variable condenser plates and turn the dial pointer so that it is horizontal. If the model is one with a band-spread pointer, the band-spread pointer should be pointed straight up. The position of the pointers should be checked before proceeding with realignment or re-calibration.

All Models: To eliminate escutcheon rattle, remove the escutcheon, discard the gasket if one is used behind the escutcheon, and bend the corners of the escutcheon out slightly so that the escutcheon will fit tightly against the cabinet when its screws are fastened.

To eliminate rattles from the dial glass, attempt to move it in all directions with the fingers. This will seat it and will also seat the mounting ring more tightly.

Discontinue No. 5133 Resistor on Battery Models: This year National Union are supplying the ballast tubes as well as the radio tubes for the Silvertone battery sets. They advise the regulation of the National Union ballast tubes is sufficient to take care of the voltage ranges encountered with the batteries.

The use of the No. 5133 resistor for the 3-volt dry "A" batteries on battery

radio sets is therefore not necessary on the 1900 line of Battery Model Radios. Last year it was found advisable to use this resistor on some battery models until the initial peak of voltage of the battery had dropped to around 3 volts after being in service for approximately 50 hours.

Sparton 931

Oscillation after installation of new set of 485 tubes: If everything tests O.K., remedy by connecting 0.001-mfd, 600-volt condenser between plate and cathode of first r-f tube in amplifier. If set hums when tuned to incoming signal, connect 0.001-mfd, 600-volt condenser between one plate and filament of 80 rectifier. *Al. Beers*

Hiss in Stewart-Warner R-138

The Stewart-Warner Model R-138 eleven tube Ferrodyne chassis has exceptionally good audio frequency fidelity characteristics. It reproduces frequencies as high as 13,000 cycles.

NOISE PICKUP

However, because of the exceptionally excellent tone quality of the Model R-138, as evidenced by its ability to reproduce all low and high audio frequencies, any static, electrical interference, station hiss, station distortion, etc., that may be present are fully reproduced.

Although these noises may be eliminated by turning back the treble tone control, we have found that in actual use it may be preferable in some cases to make a permanent circuit change so that these high, and to some people, objectionable frequencies, cannot be reproduced even with the treble tone control turned all the way up.

CIRCUIT CHANGE

This change can best be made as follows:

Remove the four nuts holding the tone compensator can to the side of the chassis. You will note that four wires come from this can. Cut the green lead about an inch from the can and tape up the bare end sticking from the can to prevent possible short circuits. Disconnect the other end of the green lead from the grid terminal of the 6C5 tube. Connect a .1 mfd, 400-volt condenser (part No. 83440) to the same grid terminal. You can get the condenser into place best if you point it to the front of the set and keep it as close to the socket as possible. Now connect a 6-inch length of wire to the

plate terminal of the 6J7 socket. This socket is the corner one, and the plate terminal has a yellow wire connected to it, which runs to the tone compensator can. After this is done, replace the tone compensator can.

You now have one end of the condenser, and one end of the lead wire coming from the plate of the 6J7 still to be connected. These should both be soldered to the yellow and green wire coming from the tone compensator unit. The best way of making this connection is to strip away a small amount of the insulation at a convenient point in the yellow and green lead, and solder all three wires together.

This circuit change will eliminate all station hiss, extraneous crackling noises, and high-frequency distortion introduced by the station.

However, it will be found that the treble control will now have much less effect than heretofore, since the higher tones have already been reduced.

"Sun-Glow" Melody Chest

Inoperative: Check 0.5-mfd section of bypass condenser connected to B plus. This is located below the detector socket, and is part of the long, 4-section metal-clad condenser pack.

E. M. Prentke

Westinghouse 12

Receiver dead: Caused by open in secondary winding of first i-f transformer. Replace. Also, check 8,000-ohm resistor in first r-f oscillator and first i-f cathode circuit for an open or an increase in value.

George F. Baptiste

Zenith 705, 706, 707, 711, 712, 750

Motorboats except when tuned to incoming signals: Replace 0.1-mfd bypass condenser in avc circuit. This is part No. 22-190 on schematic and is located between suppressor-grid socket connection of 57 first detector and chassis. Terminal resistance of faulty condenser is 25 megohms. The receiver i-f is 485 kc. *Al. Beers*

Zenith 770 B, 775 B, 476 B

Intermittent reception: Trouble due to 60-megohm leak in insulation of wire on hot side of load resistor avc circuit bypass condenser. Remedy by slipping a piece of spaghetti over insulation. The i-f for this receiver is 175 kc.

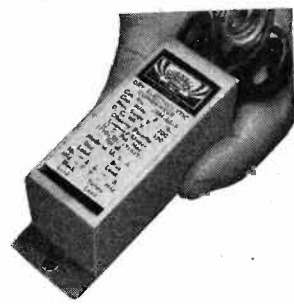
Al. Beers

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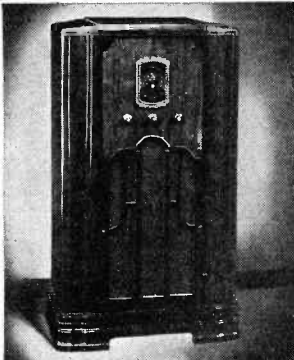


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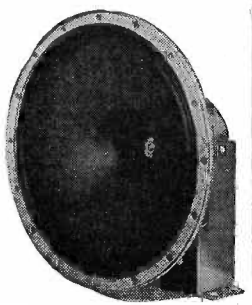
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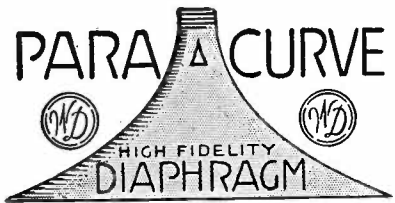
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Radio service engineers have always wanted a tube tester that would test tubes under conditions approximating their use in a radio set. Now Triplet's Power Output Tube Tester will give you this final answer to all your tube testing problems.

See for yourself how this tester picks out weak and defective tubes—how it catches those trick tubes that caused you so much trouble to find. Model 1500 has shadow graph line voltage indicator and heated tube neon short test. Dealer Net Price \$36.67.

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ASSOCIATION NEWS . . .

NEW YORK IRSM CONVENTION HUGE SUCCESS

The Third Annual New York Convention and Trade Show conducted by the Institute of Radio Service Men exceeded the fondest hopes of every one who participated. More than 2500 persons filed past the registration desk to take part in the activities, to hear the lectures, or to visit the exhibition.

Seventy Exhibitors

The Exhibition Hall contained 50 booths which were occupied by nearly seventy exhibitors. The space had been oversubscribed to such an extent that the Executive Office of the Institute was confronted with a most serious problem of finding space for all those who wished to display their wares. And, even at that, it is reported that seven firms were unable to secure space in the final analysis.

The Convention Sessions opened on Friday afternoon, October 25, with Edgar C. Arnold, President of the IRSM, presiding. Simultaneously in other rooms, the manufacturers of the Sales Managers Club and the Parts Distributors were gathered in meetings, each to discuss their respective problems. Charles Golenpaul presided over the manufacturers' group; Maurice Despres was Chairman of the Parts Distributors' meeting.

The official opening of the Convention took place at 7:30 Friday evening, at which time President Edgar C. Arnold delivered his message of welcome to the enormous crowd that filled the lecture hall to overflowing. Throughout Friday evening, Saturday afternoon, and all day Sunday the sessions continued, and the halls were filled all the while with representatives of every branch of the radio industry.

Organizations in Offing

On Sunday morning, there was a meeting of the sales representatives. Perry Saftler, 27 Warren St., New York City, was chosen to act as the temporary chair-

man, and then permanent chairman. The result of the meeting was a definite decision on the part of the representatives to create an organization, though it is not thought that the final arrangements will be made until the time of the Fourth National IRSM Convention and Trade Show to be held at Chicago next March. Information may be obtained by communicating with Mr. Saftler.

The Sales Representatives were not the only ones who took the initial step toward forming an organization during the Show, however. The Parts Distributors who had held a meeting on Friday afternoon were of the same frame of mind so far as their group was concerned, and the matter of setting up the organization plans was placed in the hands of an organization committee of which Maurice Despres, 29 Murray St., New York City, is the chairman.

The Fourth Annual New York Convention and Trade Show will be held at the Hotel Pennsylvania in New York City, October 25 to 27, 1936. In view of the unprecedented success of the third annual show it is believed that the 1936 event will outshadow the one held last month in size, in scope, and in every other way.

Electronic Organ at Show

One of the Hammond Electronic Organs was installed in the lecture hall at the Third Annual IRSM Convention, and was demonstrated during intermission periods and as a prelude to the technical sessions. Miss S. Broyde and Messrs. Frank White, John Hammond, and C. A. J. Parmentier presided at the keyboard and entertained the guests at periodic intervals throughout the three days. The Hammond Electronic Organ is a product of the Hammond Clock Company of Chicago.

"Melting Pot of the Radio Industry"

On the title page of the Program for the Third Annual Convention and Trade

Show conducted by the IRSM at the Hotel Pennsylvania in New York last month was the expression, "The Melting Pot of the Radio Industry! Service Men, Amateurs, Engineers, Distributors, Manufacturers, Broadcasters, Sales Representatives, whose interests are so closely interlocked, are accorded a most hearty welcome."

The keynote of this convention struck a new chord. In the past trade shows have been known as Manufacturers' Shows, as Distributors' Shows, as Service Men's Shows, or as Public Shows. They have not been considered industry affairs in the light that each group has needed the other to complete the picture.

IRSM has always contended that one part of the radio industry is dependent on all the other branches and that what hurts one hurts all. There have been others who have held the same belief, but it is not until recently that there has been any particular evidence that the feeling is becoming universal. The IRSM reports that as an aftermath of the Show numerous individuals connected with different phases of the industry have expressed regret that they should have overlooked this important point throughout all these years, indicating that with an increasing number of advocates of the principle, we can look forward to more united action on the part of radio's forces, from the standpoint of protecting the industry's interests as well as promoting the field of radio generally.

RADIO SERVICE ENGINEERS

The Radio Service Engineers (affiliated with the St. Louis Electrical Board of Trade) elected officers for the coming year at a meeting held in the Association headquarters, 1205 Olive Street on the evening of October 14. The following officers were elected: Chairman, E. E. Gilcrease; Vice-Chairman, J. W. Kotovsky; Secretary-Treasurer, M. Napper.

An appropriation for time on a local broadcasting station, to acquaint the public with the association and its members was approved along with other plans for the coming year.

Radio Service Men living in the St. Louis area who are not members of this association are urged to communicate with Otto Buder and get the inside dope on an up-and-coming organization that is going places and improving the radio service business in greater St. Louis.

Maurice Napper, Secretary-Treasurer.

NEW BELDEN BULLETIN

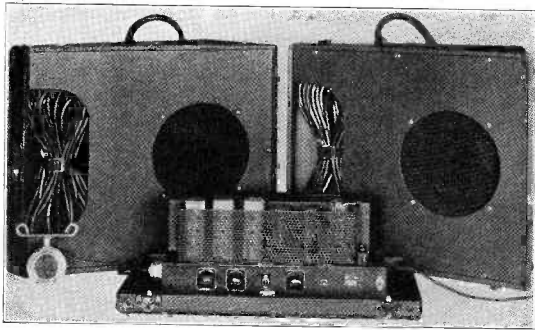
Endeavoring to provide the most complete line of all types of wire and wire accessory items used by the radio receiver distributor, and radio parts jobber, a revised and decidedly more complete radio bulletin is announced by the Belden Manufacturing Company, 4689 West Van Buren Street, Chicago.

Bulletin 6090, as the new 8-page catalog is called, includes a number of new items, such as all-wave and broadcast antenna systems, hook-up wire, and multiple conductor and shielded microphone cables. Practically all items are illustrated and carefully described as to construction and use.



The PRSMA at Philadelphia Show featured an oscilloscope, which drew a curious throng who wanted to find out just what was happening to the "light in the box."

Go after Public Address
business with



NEW 99-F OPERADIO

LOOK AT
THESE
FEATURES!

Designed to operate on 105-125 volt 50-60 cycle alternating current. Diaphragm crystal microphone has a 25-foot cable and a polarized plug. Hanging type fixture provided so that microphone can be hung from arch or ceiling if desired. Microphone and phono pick-up volume control provide for mixing voice with musical background. Compact, light, easy to handle.

Wide awake service men are going after Public Address work and going after it heavy. They have found that there's P. A. business right around the corner. They need only suggest it. And they find OPERADIO is the sure-fire equipment to buy because it gives most satisfaction and pays them most profit.

No. 99-F is NEW . . . it's a twin speaker system and has features no other system has.

Get the profit-making details now on 99-F!

OPERADIO

MANUFACTURING COMPANY
ST. CHARLES, ILLINOIS

Export Div., 347 Madison Ave., New York, N. Y.

FREE



RESISTOR CABINET

—with purchase of 35 CONTINENTAL insulated 1/2 or 1-watt resistors at your regular price of \$4.20. Cabinet for resistor stock hangs on the wall; dial the rotary color code like an automatic telephone. A watt-ohm-volt chart appears below the colored dial.

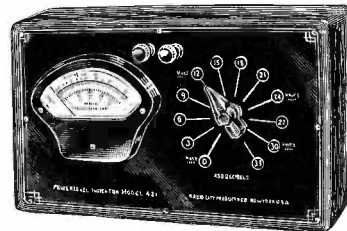
• Condenser Engineering Bulletin 103 Free •
Ask your Jobber for your copy

CONTINENTAL CARBON Inc.

13912 Lorain Ave., Cleveland, Ohio
Canadian Factory: Toronto, Ontario

New
"DEPENDABLE"

POWER-LEVEL INDICATOR Important Help For P. A. Men



Complete
\$25.85

KIT
\$21.00

MEASURES power levels from minus 12 to plus 43 decibels. Highly accurate 5" fan-type meter calibrated from down 12 to up 10 decibels. 500 micro-ampere movement. Knife-edge pointer.

Unique 10,000 ohm constant impedance L-type attenuator. Also direct-reading 4-range A.C. voltmeter for all frequencies.

Splendid instrument for gain measurements and as output meter for all circuits from voice coil impedance up to input impedance of push-pull output transformers.

"DEPENDABLE" MULTITESTER



No. 403-A

ACCURATE, up-to-date testing assured when used with "DEPENDABLE" Analyzer Unit or your old analyzer.

2,000 ohms per volt sensitivity. Contains 3-range ohmmeter; 4-range voltmeter; microammeter; milliammeter and batteries.

Every service man needs this instrument, and can afford it at its present low price.

Ready to Operate:

\$13.95

Kit: \$10.65

Write Dept. S-11 for
New 1936 Bulletins



**RADIO
CITY PRODUCTS
CO.**

88 Park Place

New York City

HIGHLIGHTS . . .

RAYTHEON COMBINATION

The Raytheon Production Corporation, 30 East 42d Street, New York City, N. Y., are offering free with each contract to purchase a definite number of Raytheon tubes the following four Weston units:

1. Selective Analyzer No. 665.
2. No. 629 Oscillator (100-3,000 kc fundamentals, battery operated, self-contained).
3. Volt-Ohmmeter No. 662 (Resistance .1 ohm to 10 megohms, voltages to 1,000 at 1,000 ohms per volt, current to 100 ma).
4. Capacity Meter No. 664 (mfd 10-200, 1-20, 0.1-2, 0.0001-0.02; a-c volts 800 at 1,000 ohms per volt).

Write for information on Deal R35-18.

FREED CO. EXPANDS

Joseph D. R. Freed, president of the Freed Manufacturing Company, Inc., announces that due to the great success of the new line of sets manufactured by his company, the organization has been compelled to move to larger quarters.

On and after November 1 the factory, executive offices and sales offices will be located at 44 W. 18th Street, New York City.

Construction work on the factory has already begun, and there will be no interruption in production. The new plant will afford production facilities three times greater than the present plant.

OHMITE CATALOG

The Ohmite Manufacturing Company, 4835 Flournoy Street, Chicago, Illinois, have available their Catalog Number 14. This 11-page catalog covers the extensive line of Ohmite rheostats and resistance units for the industrial, radio and electronic fields.

HALLDORSON REPLACEMENT TRANSFORMER GUIDE

The Halldorson Company, 4500 Ravenswood Ave., Chicago, Ill., has issued a six-page guide listing the type numbers of replacement transformers for manufactured receivers.

Also included in the guide are data on the complete line of Halldorson transformers and chokes.

Copies of the guide may be had upon request to the manufacturer.

NEW BRUNO STAFF

William A. Bruno, President of the Bruno Laboratories, announces a complete reorganization in the executive staff. Mr. P. Fernald, widely known sales executive, who was formerly connected in this capacity with the Kenyon Co., and Operadio, has been appointed as sales manager. Mr. Fernald takes up the position vacated by Mr. John Kopple, who is no longer connected with the organization.

Mr. Paul von Kunits, formerly chief engineer of the General Broadcasting System and later connected with the American Radio News Co. and Hearst Radio Inc., has been appointed as chief engineer of the radio division of the Laboratories. Mr. Fernald and Mr. von Kunits will be in direct charge of the New York office. This

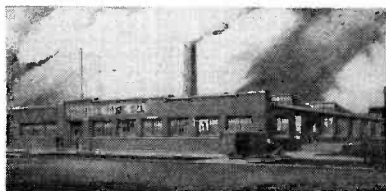
will allow Mr. Bruno to devote more of his time to the increasingly important Aviation Division of the Laboratories, in Washington, D. C.

The operating staff of the Laboratories has also been increased in order to facilitate the production of a completely new line of velocity microphones and pre-amplifiers which are about to be released. Under its new policy the company expects to move aggressively forward and looks to added expansion of its immediate activities in the near future.

OHMITE MOVES

The Ohmite Manufacturing Company has moved into their new factory at 4835 Flournoy St., Chicago. Increased demand for Ohmite products necessitated the construction of a larger plant.

The new building was started in August and has just been completed. It has more than twice the area of the old plant



and has been designed to furnish the utmost efficiency in manufacturing detail. Because of the single story construction, material handling has been reduced to a minimum and excellent light is obtained from all four sides as well as from two large skylights which can be seen in the accompanying illustration.

The new Ohmite location is on the west side of Chicago, a few steps from Cicero Avenue and one block south of Harrison Street.

GENERAL TRANSFORMER BULLETIN

The General Transformer Corporation, Chicago, have just issued a 4-page bulletin announcing some of the changes and additions to General Catalog 1934-B. The General 1935 Catalog will be issued next June.

NEW CARRON CATALOG

The Carron Manufacturing Company, 415 South Aberdeen Street, Chicago, Illinois, have just issued their new catalog. This catalog covers replacement speaker cones, replacement field coils, speaker shims, speaker cement kits, color coding enamel kits, magnetic coils, speaker cement in tubes, Carron "415" cement, speaker tester, duraluminum diaphragms, and other electrical products.

HIGH-VOLTAGE CONDENSERS

The Leichner Electric Company, 2026 Fairfield Ave., Fort Wayne, Indiana, manufacturers of glass-dielectric high-voltage condensers, have just announced a new line of mica-dielectric high-voltage units.

This new series, Type M-3, is made in five capacities ranging from 0.003 mfd through 0.01 mfd, and in two voltage ratings, 4,000 volts d-c and 2,500 volts d-c.

DAYRAD BECOMES BENDIX SUBSIDIARY

Purchase of The Radio Products Company, Dayton, Ohio, by the Bendix Aviation Corporation of America, was announced this month by executives of both companies. As a subsidiary of the Bendix organization, The Radio Products Company will retain its present name and will continue manufacturing the complete line of Radio Service Instruments widely known by the familiar trade name "Dayrad." A national advertising campaign, backed by greatly increased engineering and production facilities, is to be instituted.

The Radio Products Company has specialized for the past eight years in the manufacture of radio service equipment. From its laboratories have come many pioneering achievements including the English Reading Scale, the Sensitive Neon Shorts and Leakage Test, and the Dynamic Mutual Conductance Tube Checker. Dayrad engineers have been particularly notable for their ability to anticipate the requirements of the radio service trade.

Included in the Dayrad line are Tube Testers, All-Wave Signal Generators, Radio Set Testers and Mult-O-Meters.

TOBE OBTAINS FIRST RCA KIT LICENSE

It is announced by the Tobe Deutschmann Corporation that the Browning-35 and Tobe Amateur Receiver are now being manufactured and sold under a license agreement recently consummated between the Radio Corporation of America and the Tobe Deutschmann Corporation.

HARRIS WITH SYLVANIA IN NEW ENGLAND

The appointment of Stanley A. Harris as sales representative for Sylvania receiving tubes in the New England territory has been announced by Hygrade Sylvania Corporation as effective September 1. Mr. Harris is well known to the radio trade in New England, having served in this territory for a number of years as RCA sales representative. He will make his headquarters at the Hygrade Sylvania Boston office, 10 Post Office Square.

He will be assisted by C. J. McLean, who has been associated with Hygrade Sylvania as special field sales representative for the past year.

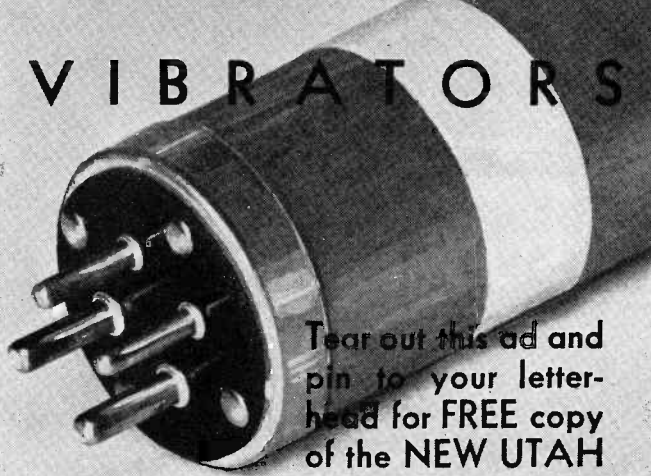
NEW 1936 ALLIED CATALOG

Allied Radio has prepared a new "streamlined" type of catalog which they claim to be the most complete, compact and best indexed Radio Supply Guide ever published. Everything in the Service, Dealer, Amateur and Set-Builders' fields, is covered 100 percent. Many new and exclusive radio developments are featured. The main sections of the new Allied Catalog are devoted to Metal-Tube, All-Wave, Short-Wave, Battery and Auto Sets; new Public-Address Sound Equipment; new Service Test Equipment and Tools; Short-Wave Receiving and Transmitting gear—and thousands of standard replacement and set-building parts. The Allied Catalog has been carefully arranged so that it is easy to find what you want.

(Continued on page 528)

UTAH

VIBRATORS



Tear out this ad and pin to your letter-head for FREE copy of the NEW UTAH General Catalog of vitalized radio parts

UTAH RADIO PRODUCTS CO.,
Orleans St., Chicago

P.A. Systems



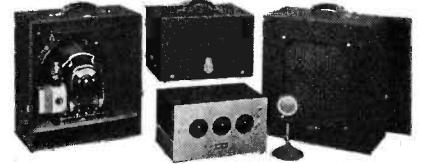
MONEY MAKERS

... so Efficient, Flexible, Economical

For sale or to rent Bell P. A. Systems are money-makers—other radio men have proven it. There's a Bell System for meeting every demand—equipment that is highly efficient, dependable and fool-proof in every respect. Simple to operate and low in cost they open a big market in industrial as well as commercial fields. Don't postpone—get your share of this business.

Jobbers!

We have a very attractive proposition — including extensive sales promotion assistance. Other jobbers have found it extremely profitable. A few select territories are still available. Let's discuss the subject fully.



30 Watts — Twin Speakers

The Model P. A. 5C meets the demand for powerful equipment. 30-watt output. Two input channels permits simultaneous use of microphone and phono pick-up. Two heavy-duty G-12 speakers—with facilities for using six. High fidelity crystal microphone. Three compact Keratol covered carrying cases.

WRITE TODAY for COMPLETE DETAILS

Act Now!

BELL SOUND SYSTEMS Inc.
61-62 East Goodale St.
COLUMBUS, OHIO

Try this handful!



Midget Electrolytic

Here's an 8 mfd. 450-volt dry electrolytic . . . shown actual size . . . see how it fits that midget chassis or other crowded assembly. And remember, it's an AEROVOX product. That means full capacity, conservative working voltage, no skimping, and built for "stay put" jobs.

- 200- and 450-volt ratings. 1 to 10 mfd.
- Heavy cardboard case. Wax sealed. Mounting flanges. Generous pigtails.
- Used singly or grouped. Tape together for any combination.
- Stock small assortment. Be ready for any service call at mighty small inventory investment.

New Catalog *Just off press. Covers complete line of condensers and resistors. Also sample copy of Research Worker. Sent on request. Meanwhile, meet the Aerovox jobber.*



CORPORATION

80 Washington St. :: Brooklyn, N. Y.

"SERVICEMEN ARE TWO YEARS BEHIND THE LABORATORIES!"

... So said a trade leader recently. He added: "Hundreds of servicemen will need additional help before they will be qualified to repair the complicated new radios now being distributed and which soon will be needing service. Servicemen **MUST** keep up-to-date—or make way for someone who will!"

To those who realize the truth of this assertion, Sprayberry Training should prove decidedly interesting. It is complete, practical advanced training, NOT for beginners but for men already in the service business. It keeps you up-to-date on all types of radio work—shows you the easy way of doing hard jobs. You pay for no "fluff," costly bindings or meaningless theory. It is sound business and technical training of the most complete and practical sort—at a price within the reach of all. Investigate it today!

"IS YOUR FUTURE IN SERVICING WORTH \$20?"



F. L. SPRAYBERRY 2548 University Place, N. W. Washington, D. C.

Without obligation, please send your free booklet, "PUTTING PROFITS AND EFFICIENCY INTO SERVICING."

Name

Address S-11-35

THE MANUFACTURERS . . .

HANDY RESISTOR CHEST ANNOUNCED

A new and unusual container for a complete stock of resistors and other small radio parts or tools has been introduced by the International Resistance Company, Philadelphia, Pa. It is known as the IRC Resist-O-Chest which, as the name implies, is a sturdy 8-drawer fibre-board chest of drawers which will add much to the efficiency and appearance of any radio bench where it is employed. This is supplied free with the purchase of a stock of fifty-six of the new IRC 1-watt Insulated Metallized Resistors.

All drawers are partitioned for holding different resistors of different ranges and there is a large drawer at the bottom for wire-wound units, etc. All told, the Resist-O-Chest will hold several hundred resistors or other parts. It stands 9½ inches high, 4¾ inches wide by 5¼ inches deep and is attractively finished in silver and blue. Handy resistance formulas and a wattage and voltage chart are supplied with it.

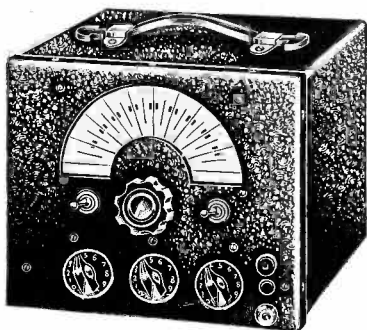
The fifty-six 1-watt Insulated Metallized Resistors include two each of twenty-eight popular ranges shown by extensive IRC records to be most frequently required for service and amateur radio work. It is possible to obtain almost any needed resistor or resistance combination with them.

NEW CLOUGH-BREngle ALL-WAVE SIGNAL GENERATOR

A newly announced addition to the line of test equipment manufactured by the Clough-Brengle Company of 1134 West Austin Avenue, Chicago, Illinois, is the Model 82 All-Wave R-F Signal Generator.

Continuous frequency coverage of all i-f, broadcast and short-wave bands from 90 kc to 20 mc is secured through the use of six tuning bands. The 8" open-face tuning dial is directly calibrated on fundamentals over this entire range.

The new C-B "Three-Rung" ladder type attenuator with interpolating control provides easy setting of output for work on the most sensitive receiver. Accurate calibration of output ratios are possible for avc and sensitivity tests.



Tuning band trimmers and similar causes of frequency shift are eliminated with the result that the original high accuracy of calibration is maintained after long service. Each instrument is laboratory checked against crystal-controlled laboratory standards, it is said. Unmodulated

and modulated r-f, as well as 400-cycle audio outputs, are available. Two type '30 tubes are used—one as an r-f generator and the other as an audio generator. The output is constant impedance, 200 ohms.

By the addition of the new C-B Model 81 Calibrated-Sweep Frequency Modulator, this or any standard oscillator is usable to produce selectivity curve images on any standard cathode-ray oscillograph.

Full information may be had by writing for the new 1936 catalog just issued by the manufacturer.

NEW BRUNO MICROPHONE

The Bruno Laboratories, of 20 W. 22nd St., New York, N. Y., have brought out a new velocity microphone, Model SK-2, in the lowest price class, which is said to be a radical departure from any heretofore presented. The new type case completely eliminates cavity resonance from this source and thus banishes completely the "tinniness" of sound so often associated with very low-cost microphones. Another feature, usually found only in higher priced models, is the use of over-size 36 p.c. cobalt steel magnets. This is the same percentage of cobalt as is used in the broadcast class microphones, it is said, and through it the output level



has been greatly increased. Due to the lack of standards of measurements for output level of microphones, and the fact that each manufacturer seems to pick his own arbitrary method of rating, the Bruno Laboratories feel that manufacturers' ratings are fast becoming meaningless. Therefore instead of giving such a rating it simply states that it believes this microphone to have a greater output, and better frequency characteristics, than any other velocity microphone in its price range. A pre-amplifier using a single 6C6 tube in triode connection, (mu of 24), is more than ample to bring the output up to a point greater than that of a standard double-button carbon microphone.

Another disadvantage hitherto present in low cost velocity microphones was tendency of the microphone transformer to pick up stray fields in its windings and in this manner cause hum in the output. This trouble has been overcome in the present model by the use of two methods. That part of the microphone case which houses the transformer has been specially designed and is constructed of a material possessing high magnetic permeability and which makes an extremely effective shield. The transformer coil is of "electric metal" whose high permeability makes possible the use of a very small winding without

sacrifice of inductance. The smaller the winding that can be used, the less its tendency to pick up hum. Incidentally this also contributes to the excellent high-frequency characteristic as the distributed capacity is kept at the lowest possible point. The device is furnished with output impedances of either 200 ohms, 500 ohms or to grid. Its frequency characteristic is plus or minus 2 db from 60 to 10,000 cycles, it is stated.

Finished in handsome black, the case measures 6" x 2¼" x ¾" and the complete unit weighs 1¾ lbs. It is small enough to fit comfortably in the palm of the hand. Complete information and literature on this and other units will be gladly supplied to anyone requesting it from the manufacturer.

NEW AERIAL ELIMINATOR

A scientifically designed substitute for an aerial, which will operate equally well on short-wave receivers down to 80 meters and broadcast receivers, has been designed by the engineers of Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio.

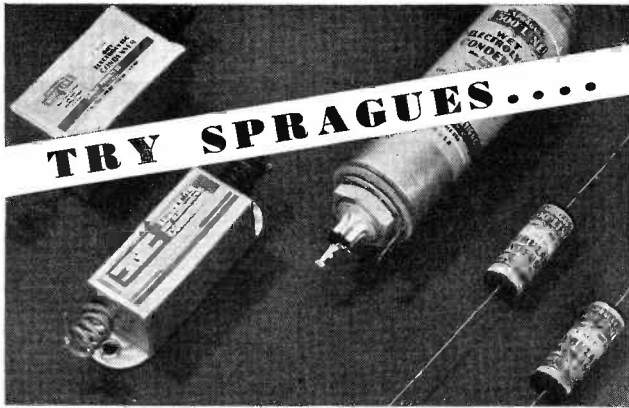
This device is not intended to replace all aerial systems for radio receivers, but is to be used in locations where a conventional aerial is impractical to install, for demonstrations, and as a test aerial for Service Men. The principle of operation is to divert radio-frequency signals from the power supply line to the receiver. In residences where the electric wiring is entirely shielded by grounded metal conduit, there is practically no pick-up of radio energy by the power lines, and, consequently, the efficiency of the aerial eliminator is greatly decreased under these conditions. In the older electric installations where the wiring is in the open, insulated with porcelain knobs and tubing, a considerable amount of radio energy is collected by these exposed wires and the new device performs as well as an outdoor aerial.

The Continental Aerial Eliminator contains a high-frequency choke especially de-



signed to block the radio impulses on the power line from being shunted to the ground within the receiver. A condenser offering a low impedance path to radio waves is tapped off one side of the line ahead of the high-frequency choke, offering an easy path through the antenna circuit of the receiver for radio signals. The size of the condenser has been selected to provide the lowest impedance possible to the radio signals and at the same time effectively block the low frequency a-c line current.

In the accompanying circuit, dotted lines suggest that one side of the power supply



and Note the Difference !

Countless radio sets are working far below their peak efficiency—because poor condensers *won't let them do any better!*

When filter condensers fail to supply the proper voltage—when cheap, inferior condensers are used—nothing about a radio can be wholly right. To test this assertion we only ask that you take a "sick" radio and equip it THROUGHOUT with Spragues. You'll be amazed at the improvement in "pep," volume and tonal quality.

Remember: You'll never go wrong with a Sprague. Every condenser is guaranteed.

SPRAGUE CONDENSERS

North Adams **SPRAGUE 600 LINE** Mass.

*Priced to sell
—Built to
outperform*



**ARE YOU, TOO,
CASHING-IN ON THIS
PROFIT-MAKING FILTER?**

Outstanding results * the best materials including Miller exclusive duo-lateral wound coils * a handsome unit * and priced at \$4 list—this combination has turned the trick for dealers everywhere who have made it a point to sell the Miller Line Filter for positive noise elimination. The unsurpassed efficiency of this unit will definitely filter-out all high frequency and household appliance disturbances from power lines forever.

Don't pass up this easy, extra money in your territory. There is no installation expense. The Miller Filter just plugs in. Ask your distributor, or write

**ASK ABOUT
THIS DISPLAY**



Miller **LINE FILTER**

J. W. MILLER COMPANY

5917 South Main Street Los Angeles, California



Mr. E. H. Rietske, President of CREI and originator of the first thorough course in PRACTICAL RADIO ENGINEERING.

... A NEW SERVICE COURSE for SERVICE MEN

who realize that better trained men DO get ahead!

This new course is NOT to be confused with other "service courses." It is NOT our aim to bring new men into an ALREADY OVERCROWDED field . . . but rather to help the experienced Serviceman to get out of a routine job into a position where he can command the position of an engineer, and the salary that goes with it.

This Course Covers Both Service and Public Address Engineering

We offer this new course for men interested in Service Engineering ONLY! There is no waste material. You receive complete instruction that covers all branches of Servicing and Public Address Engineering. Also covered are the latest works in vacuum tubes, circuits, acoustics and the treatment of auditoriums. NOW is the time to plan your future in a field where TRAINING PAYS.

FREE!
*Write Today for This
NEW 48-PAGE
ILLUSTRATED
BOOKLET*

This new catalog fully describes our various Home Study and Residence School courses in Practical Radio Engineering. Sent FREE to anyone who requests it. Write today. (If interested in our Service Course, ask for special Service Course Supplement, which gives complete details and outline of course.)

Capitol Radio Engineering Institute

Dept. S-11

14th & Park Rd., N.W., WASHINGTON, D. C.



PROBLEM

To find a reliable source for all your radio supplies which will bring you the highest grade of merchandise at the lowest prices—a vast selection to fill every Radio Service need—and a speed and accuracy in shipment that cannot be excelled.

APPLY —



ALLIED's 1936 Catalog—the leading Radio Supply Guide. A real index to radio progress—brimming over with fine standard merchandise lines at lowest prices—sparkling with new test equipment developments, new P.A. systems, new metal tube radios—rich with fine selections of tools and thousands of high grade parts—everything to save you money and help you succeed.

RESULTS:

Save time—save money—get any part, any brand any time you want it—at the lowest prices—and enjoy ALLIED's speedy, helpful personal service, besides. Keep an ALLIED Catalog by your side—it pays!



ALLIED RADIO

833 W. Jackson Blvd.
Chicago, Ill. Dept. N.

Send me your FREE 1936 Catalog—the most complete Radio Supply Guide ever published.

FREE

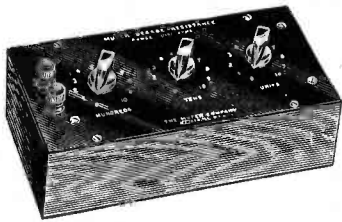
Name
Address
City State.....

line may be grounded, which would prevent its being used as a source of radio signals, particularly if the receiver uses a normal ground wire. It may be necessary to reverse the aerial eliminator terminals in a light socket to determine which position results in the greatest signal, indicating that the condenser and choke are then connected to the high side of the power supply system and producing the maximum signal response.

The new Continental Aerial Eliminator should be used with a good ground wire and depends only upon the signals picked up from the power line.

MUTER DECADE RESISTANCE BOX

The Muter Company has just introduced a new adjustable Decade Resistance Box that has all the necessary requirements for general service at a price that permits general shop usage. It is designed for a high degree of accuracy—about 1/2 of one percent—but is so substantially built,



it is said, that the rough and inexperienced handling in the shop will not damage it.

In designing this unit the Muter engineers attempted to provide the utmost in convenience by building four boxes, each of different resistance value. By using a combination of two of these boxes it is possible to obtain any resistance from .1 ohm to 111,111 ohms in multiples of .1 ohm.

MINIATURE AUDIO TRANSFORMERS

The Alloy Transformer Company, 135 Liberty Street, New York City, New York, have a miniature line of audio transformers. These units, which are said to have a frequency response uniform within 1 db from 30 to 15,000 cycles, are of the "Permalloy type" with lap-jointed laminations.

These units are housed in humproof high-permeability "Alloy" castings and are fully shielded electromagnetically and electrostatically, it is stated. These transformers are completely sealed and 1000-volt insulation is used throughout.

Information is available from the Alloy Transformer Company.

WESTON CAPACITY METER

A multi-range capacity meter designed to meet requirements for a small, reasonably-priced unit, has recently been placed on the market by the Weston Electrical Instrument Corporation, Newark, N. J. The new meter, known as Model 780, provides full scale ranges of 10/1/0.1/0.01 microfarads, covering all capacity ranges in common use in radio receivers, since readings can be made down to as low as 100 micromicrofarads. It operates directly from any 115-volt a-c outlet.

A convenient voltage adjuster compen-

sates for small variations in line voltage, and an internal transformer insulates the device from the line. A pair of long test prod leads is provided with each instrument.

The meter has exterior dimensions of 5 1/2 in. x 3 3/4 in. x 2 1/2 in., and weighs approximately 1 3/4 pounds.

NEW DUMONT CONDENSERS

The Dumont Electric Co., Inc., 514-516 Broadway, New York, N. Y., are now producing a new type of dry electrolytic condenser. This unit is small and compact in size and has a rating of 8 mfd and a peak voltage of 600 volts.

This condenser is housed in a silver carton with self-mounting features, the size being 2 1/2 inches long by 1 1/8 inches wide by 3/4 inch thick. It is said to have a long life, guaranteed for 2 years of service.

NEW RESISTOR CABINET

A resistor cabinet with novel features is being offered by Continental Carbon, Inc., 13900 Lorain Ave., Cleveland, Ohio, with the purchase of thirty-five standard insulated resistors. The cabinet is designed to hang on the wall, and has bins for 130 resistors. Opposite each bin a range of resistor values is printed on the cover to facilitate quickly locating any desired size. In addition, the cover has a rotary color code dial with metal eyelets so arranged that the disc can be rotated with the tip of a pencil or a screwdriver to determine the resistance value represented by the three



characteristic colors in the RMA system of resistance designation.

Under the color code dial, a chart giving the relation graphically between the watt rating and the maximum voltage, which may be applied to any standard resistor, appears. By simple calculation, the maximum current which may be carried by the resistor of any given size and watt rating may be determined on the chart by dividing the watt rating by the maximum voltage, which may be applied to it.

The resistor cabinet serves the additional purpose of providing a clean receptacle for these important radio components.

LINE FILTER FOR RECEIVER

A line filter that employs both inductance and capacity filtering for elimination of noises picked up by receivers through power lines, has been announced by the J. W. Miller Company, Los Angeles.

Equipped with rubber cord and unbreakable plug, the compact unit may be installed readily on any broadcast, short-wave or all-wave receiver by connecting in the line and attaching a single ground wire.

Special duo-lateral wound chokes pro-

duced by Miller-designed winding machines are used exclusively in the line filter, with oil-impregnated paper-dielectric condensers.

The complete assembly is housed in a metal case finished in Kem-Art black, with polished chromium plated ends.

HIGHLIGHTS

(Continued from page 524)

WHOLESALE OPENS NEW BRANCH

The new Chicago branch office of Wholesale Radio Service Company, Inc., located at 901-911 West Jackson Blvd., opened Saturday, September 21, 1935. The opening was timed to coincide with the mailing of Wholesale Radio's new 196-page fall catalog, and as a result the store was jammed from morning to night with radio dealers, Service Men and amateurs.

Occupying more than 20,000 square feet of floor space in a centrally located building, this new Chicago radio establishment is said to be fitted up in modern style, with convenient demonstration booths and display counters. A large stock of all-wave and short-wave receivers, short-wave transmitters, and amateur, radio service and refrigeration replacement parts is kept on hand. Quick shipments from this stock are made to mail-order customers in the west and middle west.

The general manager of the new store is S. W. Berk, who was formerly floor manager of Wholesale Radio's main office at 100 Sixth Ave., New York City, and for a while manager of the firm's Atlanta branch. Marvino Roye is purchasing agent and J. E. Snyder is office manager. The technical staff includes the following: Arthur Rattray, Ed DeCancq, John Morgan, Earl Ruleson and Edward Hoffman.

The opening of this branch marks the entrance of Wholesale Radio Service Company into the Chicago territory.

RADIO FIELD SERVICE DATA, by A. A. Ghirardi and B. M. Freed, published by the Radio and Technical Publishing Company, 45 Astor Place, New York City, N. Y., 240 pages, flexible covers, price \$1.50.

This book was prepared to supplement *Modern Radio Servicing* for the purpose of presenting, in a convenient and useful form, practical radio reference data which the authors have found to be useful to radio Service Men when they are actually on the job in the field. As a result it has been bound in flexible form so that it may be carried along in the Service Man's tool bag.

A table of intermediate-frequency values in Section I supplies data for i-f amplifier alignment work. The "Trouble Symptom and Remedy" compilation in Section II represents accumulated servicing information gained by actual service work on receivers of each model and make listed (88 pages), under various installation and operating conditions. Section III deals with special remedies to be applied for eliminating ignition interference in numerous makes of automobiles.

Some 22 additional sections of various sorts of tables, charts, formulas, calculations, etc., are included. A cross-referenced index at the back of the book is also included.

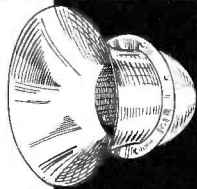
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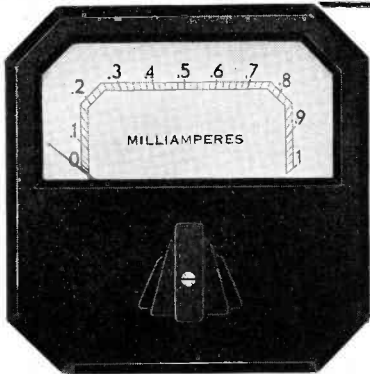
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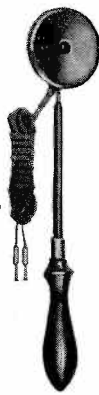
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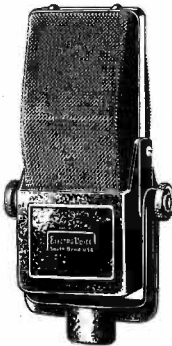
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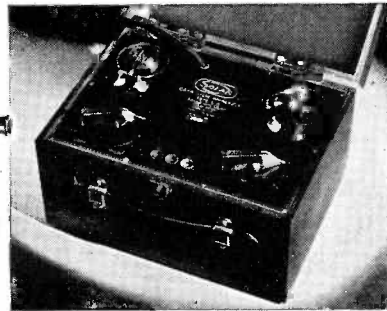
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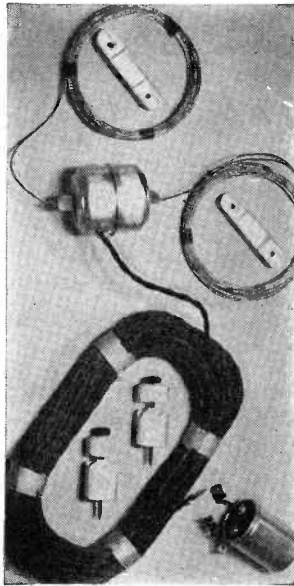
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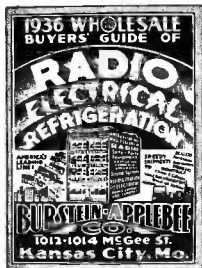
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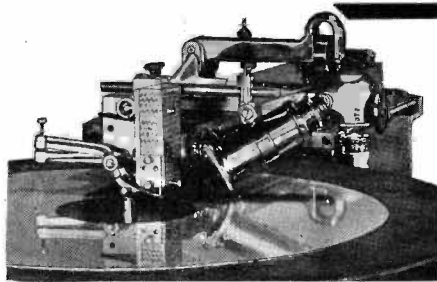
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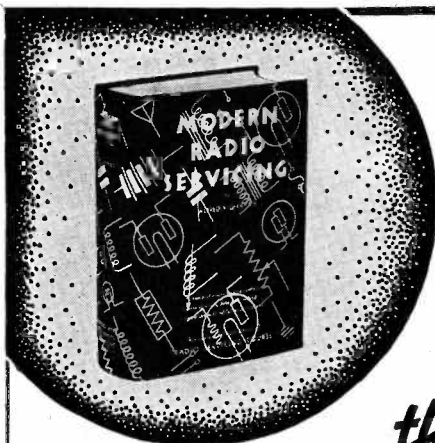
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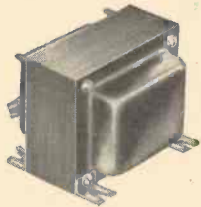


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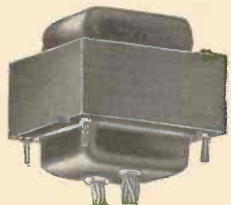
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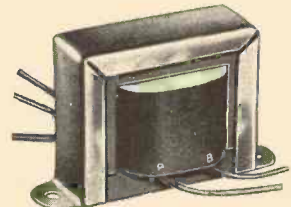
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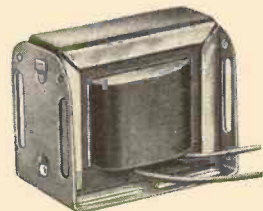
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accurately than any other known device. Each calibrator is supplied with individual crystal calibration showing temperature at which made. This makes possible the most accurate work in radio service, testing and design work. Service associations and parts distributors should be particularly interested

in this instrument, which could be made available to individuals as needed. Write for descriptive folder.



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